CORONET

Peter Grosvenor/James McMillan

THE BRITISH GENIUS

'A splendid book of story-packed pages which tells you what is right rather than what is wrong with Britain'
DAILY MIRROR

THE BRITISH GENIUS

Too much can be made of 'the British disease'. Over the years our strike record compares favourably with many countries including the U.S., Canada and Italy. Figures compiled by the International Labour Office for the ten-year period 1961–70 show Canada and the U.S. have the worst strike record. The average annual number of days lost per thousand workers were highest in Canada (1207 days) followed by the U.S. (1121), Italy (1093), India (813), Australia (464), Denmark (414) and United Kingdom (321).

But such is the genius of the British for presenting themselves in a bad light that the world believes we are the most strike-torn country in the world. We do love our disasters and crises and we write them up with relish. Not surprisingly foreigners often take our difficulties more seriously than we do ourselves. During the three-day week of the early part of 1974 occasioned by the coal dispute the Americans thought we were in a very bad way, shivering and even half-starving. Supposedly quite sensible commentators even suggested the country was on the verge of revolution.

For the sake of her standing abroad Britain urgently needs to cheer up her image. We also need to give ourselves a pep talk. The national habit of self-denigration means we consistently achieve less than we otherwise would do. That is the real reason for writing a book like *The British Genius*.

The British Genius

Peter Grosvenor
and
James McMillan

CORONET BOOKS
Hodder Paperbacks Ltd., London

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First Published by J. M. Dent & Sons Ltd, 1973
Coronet edition 1974

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Printed and bound in Great Britain for
Coronet Books,
Hodder Paperbacks Ltd,
St. Paul's House, Warwick Lane,
London, EC4P 4AH
by Hazell Watson & Viney Ltd,
Aylesbury, Bucks

ISBN 0 340 18770 0

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AUTHORS' INTRODUCTION

Since the first edition of *The British Genius* was published at the beginning of 1973 a good deal has happened to affect the British economy adversely including the virtual doubling of world commodity prices in a year and the quadrupling of the price of oil. Increases were to be expected, but not on this scale. Consequently what could have been a small balance of payments surplus was transformed into current account deficit for 1973 of £1,470 million. Added to that the country has suffered badly from the self-inflicted wounds of strikes and go-slows, notably that involving the miners. But our confidence in the stability and future prosperity of this mature industrial democracy remains undimmed.

The major cause for rejoicing is, of course, the immensity of the oil finds in the British sector of the North Sea. The first major field, British Petroleum's Forties, was only announced in October 1970 but in little more than three years 15 more were discovered and all were expected to be in peak production by 1980 with a total output of up to 150 million tons a year. So even allowing for an increase in consumption above the present level of somewhat over 100 million tons a year Britain can look forward to becoming a net exporter of oil. In this event by a pleasing irony the high price of oil will then work to the country's advantage, producing a turn round in balance of payments terms of some £6,000 million and transforming the hefty deficits of 1973 and 1974 into handsome surpluses. In addition the British oil is in general higher quality (suitable for petrol unlike the heavy oil needed for industrial use), and therefore a higher priced fuel. Oilfields with romantic names from Beryl, Maureen and Josephine to the 1973 discoveries of Bristling, Dunlin, Piper, Thistle, Hutton and Alwyn (old English for 'noble friend') demonstrated the astonishing oil richness of the North Sea. The rate of discovery was extremely high; the eighty or so

exploratory and appraisal wells drilled in 1973 produced some ten commercial discoveries, a success rate of one in eight which is about double the normal oil industry average. Of course there were difficulties, not least the sheer physical problems of drilling in water, where savage weather and stormy seas damage rigs and even on occasion cause them to capsize and sink on location, as happened to one in 1973. What must also be remembered is that there can be no question of standing still. The present fields will last not far beyond 1990. New ones must be discovered. Fortunately the British section of the North Sea is bustling with activity, the Black Gold Rush is truly on, and over 300 companies are involved including of course Shell, BP (49% Government owned), the nationalized industries and American and other foreign companies. And now there is fresh promise of oil discoveries in the Bristol Channel and the Celtic Sea off South-East Ireland, where BP is active.

For years the British economy has suffered from an indifferent rate of growth, partly because a country with a high ratio of imports and exports in relation to its total national income, is specially vulnerable to balance of payments problems. Consequent 'stop-go' policies to cure deficits have had a depressing effect on businessmen's expectations and chronic under-investment has been the bane of the British economy. Now we are in sight of the end of all that.

Meanwhile, of course, what Lord Mancroft has called 'the national pastime of kicking the ball into our own net' has continued unabated. The Labour M.P. John Grant in his review of the hard-cover edition of this book criticized us for not recognizing the contribution of British trade unions. The events of 1973–74 answered him rather effectively. Apart from the miners' strike which despite its political effects was basically a naked confrontation on money and at least understandable, the country was plagued by silly strikes, most notably in the car industry where 460,000 cars were lost by disputes in the car factories themselves or among component suppliers. The loss of exports and the extra sucking in of foreign imports because of the non-availability of British

cars was responsible, motor industry chiefs reckon, for some £500 million damage to the balance of payments in 1973. British Leyland who lost some 11,700,000 man-hours in 1972–73 (half due to external factors like stoppages among suppliers) would have paid each of their workers an average £1 a week more but for strikes.

One prime cause of disputes in Britain is the multiplicity of unions within an industry. The tiresome disruption of rail services over two years was not a 'sensible' dispute between management and unions over money but an inter-union quarrel between the dwindling ASLEF craft union fighting for survival by demonstrating its militancy in the face of the big National Union of Railwaymen. Such inter-union disputes are costly and though unions are supposed to exist to boost workers' wages it is arguable that if by some magic wand unions could be abolished overnight the British worker would be much better off. For working much more efficiently he would be much better paid. Of course the archaic structure of British trade unions is largely historical. It is the legacy of an early start as an industrial power. Not for us the admirable solution imposed on Germany after the war when on the advice of Ernest Bevin and the British trade unionists the labour movement starting from scratch again was restructured into sixteen industry-wide unions. So Ford of Germany is free of inter-union squabbles and leap-frogging wage claims whereas Ford of Britain has no less than 16 unions to deal with.

It should be an urgent task of the TUC to try to reduce the number of unions. But too much can be made of 'the British disease'. Over the years our strike record compares favourably with many countries including the U.S., Canada and Italy. Figures compiled by the International Labour Office for the ten-year period 1961–70 show Canada and the U.S. have the worst strike record. The average annual number of days lost per thousand workers were highest in Canada (1207 days) followed by the U.S. (1121), Italy (1093), India (813), Australia (464), Denmark (414) and United Kingdom (321).

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For the sake of her standing abroad Britain urgently needs to cheer up her image. We also need to give ourselves a pep talk. The national habit of self-denigration means we consistently achieve less than we otherwise would do That is the real reason for writing a book like *The British Genius.*

Its message is as true today as when the book was first published in 1973. We have completely revised and up-dated this paperback edition to give latest statistics and to take account of the latest economic circumstances.

AUTHORS' ACKNOWLEDGMENTS

We are indebted to a great many people during the course of our researches who have generously given their time in providing interviews and in some cases their expert help on technical matters in the manuscript.

Our particular thanks are due to Lord Snow and the late Sir Lawrence Bragg for their reminiscences on the nuclear physics heyday of the Cavendish Laboratory at Cambridge; to Professor Sir Martin Ryle of the Mullard Radio Astronomy Observatory for guiding us through some of the complexities of the British contribution to radio astronomy; to Dr Robert G. Edwards of the Physiological Laboratory of Cambridge University for frank guidance on the touchy subject of 'test-tube' babies, though the views expressed outside quotation marks are our own; to mini-car designer Sir Alec Issigonis, exponent of the once revolutionary notion that 'ugly is beautiful' in efficient car design; to Dr Stanley G. Hooker of Rolls-Royce for intriguing information on Rolls-Royce's original involvement in the jet-engine business; to Air Commodore Sir Frank Whittle whose claim to primacy in the invention of the jet engine is clearly established in these pages; to Francis Bacon of Cambridge whose invention of the fuel cell was crucial in making the American moon landings possible; to Sir Christopher Cockerell, inventor of the hovercraft; to Leslie N. Phillips of the Royal Aircraft Establishment, Farnborough, one of the pioneers of carbon fibres; to Dr Denis Melrose of the Royal Postgraduate Medical School of Hammersmith Hospital; to Dr Maurice Wilkins of London University who prompted some of the social considerations relating to the DNA-RNA discovery; and to numerous people in the field of the arts who talked at length to us, notably Sir John Betjeman, Henry Moore and John Osborne.

We would also like to thank the authors and publishers

concerned for permission to quote from the following books:

The Work of the Queen by Dermot Morrah (William Kimber & Co. Ltd)

The Age of Keynes by Robert Lekachman (Penguin Books)

Modern Capitalism by Andrew Shonfield (Oxford University Press under the auspices of the Royal Institute of International Affairs)

The City in World Affairs by W. M. Clarke (Institute of Economic Affairs)

A History of British Insurance by Harold E. Raynes (Cambridge University Press)

Into the Wind by Lord Reith (Hodder & Stoughton), reprinted by permission of A. D. Peters & Co

Kenneth Harris Talking To by Kenneth Harris (Weidenfeld & Nicolson)

St Michael. A History of Marks and Spencer by Goronwy Rees (Weidenfeld & Nicolson)

Wearing Spurs by Lord Reith (Hutchinson)

Black Boomerang by Sefton Delmer (Secker & Warburg)

Chapter 1

THE ROOTS OF GENIUS

On the morning of 21st July 1969 the world's press and television hailed the landing on the moon by two American astronauts. The Hong Kong newspaper *China Mail* remarked:

> The first words spoken on the moon were English.
>
> Bled white by two world wars, unable to balance its economy, and stagnating under constant union rows, Britain no longer takes a leading role in the decisions of the world.
>
> But in spite of all this it has left one great legacy—its language.

Thus in such sepulchral tones did many overseas commentators speak about Britain in the latter half of the twentieth century. They all but added the letters 'RIP' after her name and regularly tolled the knell of passing greatness. The condolences were—and are—premature They are also repetitive.

Hardly a generation has passed since the reign of the first Elizabeth without Britain's epitaph being written. In 1828 Fenimore Cooper, the American author, was penning the view that England 'has now descended to the level of a third-rate power': this only thirteen years after Waterloo and on the eve of the burgeoning empire of trade glorified by the Great Exhibition of 1851. Indeed at the very moment when Fenimore Cooper was pityingly relegating Britain, the Scots author and critic Christopher North was saluting the dominions of King George IV 'upon which the sun never sets'.

Scribes and rulers alike to chart Britain's downfall have never been wanting. Time after time they have come peri-

lously near to being right. Philip of Spain, Louis XIV, Napoleon, Kaiser Wilhelm II, Adolf Hitler – the 'damn near things' litter British history: squeaks so narrow that they would not be out of place in a schoolboy thriller serial.

Yet always the British survived. And just when everyone said, 'Well, they'll live—but they're senile', the British genius proved them wrong. The astonishing resilience of the race has time after time confounded her foes and delighted her friends.

That genius lives on in the latter part of the twentieth century; as diverse, extraordinary and comprehensive as at any period in the nation's history.

It was said of Christopher Wren that to view his monument it was only necessary to look around. So it is with the British genius: for government, colonization, justice and that precious intangible, a sense of balance, which is more than mere tolerance.

The most stable communities on earth are the ones most solidly based on the British race and traditions: Australia, New Zealand, Canada. They are, of course, no longer peopled exclusively by British settlers—in Canada's case they never were—but the clear majority of the populations of Australia and New Zealand are British and in Canada 8 million of the country's 20 million are from 'the Motherland'.

That title has a quaint sound today. Yet it is an exact description of Britain's relationship with lands discovered by British adventurers, developed by British enterprise and fashoned in Britain's image.

At the height of imperial power, when Sir John Seeley was philosophizing about the expansion of England, a deprecating attitude was meet and right. We had 'picked up the Empire in a fit of absence of mind'. When your position is unchallengeable, when your superiority is effortless, you can afford to be modest. You know—and foreigners know you know—that the shy diffidence will be dropped if things get serious.

But after generations of self-denigration, when the country has been described—in an official report on the diplomatic

service—as being 'a major power of the second rank', it is time to reassess the situation and give chapter and verse to sustain the claim that Britain's role in the world is immensely important and that it is an expression of an unchangeable asset: the British character.

What that character is is easier to suggest by examples than to dissect objectively. It is Saxon stubbornness: refusing to bow before kingly despots or to accept the feudal system as practised on the Continent. It is Parliament with its plain, russet-coated champions facing Charles I, himself aloof, disdainful but, alas for him, not divine. And it is the popular rejection of that Parliament when it repudiated the freedom it set out to defend.

The British character is an amalgam of Puritan thrift, sobriety, self-help with not a little humbug, and a joyous abandon of restraints when the puritanism becomes too irksome. Not by accident did England pioneer the mini-skirt while retaining stern licensing laws for the sale and consumption of liquor. There is Celtic feyness mixed with shrewd Northern calculation, Irish wit and gaiety, mingled with Scots practicality, the English sense of duty and service which still lingers on from the Victorian Christian public school tradition founded by Thomas Arnold.

The diversity in England alone is astonishing. The difference in dialects between two counties – what amounts to no more than a half-hour's car journey – it so pronounced that visitors having accustomed themselves to one accent find it all but impossible to grasp the new one.

Matching the contrast in tongues is the variety of British scenery: the chalk downs of Sussex, the leafy lanes of Surrey and Warwickshire, the fruit lands of Kent, the low, haunting landscape of the fens, the rock-ribbed coast of Northumberland, the towering mountains of the Highlands, the tarns of the Lake District, the valleys of Wales, the dales of Yorkshire, the tors and the fells of Devon. Here is a country of compelling contrasts in scenery and personality packed into barely 100,000 square miles: one-thirtieth of the

land surface of the United States, one-eightieth that of Soviet Russia.

If that were all to Britain: a fabulous history, a vigorous variety of speech, a lovely, everchanging countryside, it would in truth be no more than a 'must' on the American tourist's itinerary. But behind the smiling landscape, the phlegmatic outlook, the furrows of the past, can be found the real reasons why England will not lie down: Norman ruthlessness and Viking venturesomeness.

The British have not remained free of foreign conquest for nearly a thousand years by virtue of their kindliness, or even by their bulldog stubbornness. The sea they conquered, but it needed an iron will to hold on to the conquest. It was not merely the storm-tossed ships on which his armies never set sight that cost Napoleon the empire of the globe. It was Pitt's subsidies to continental courts and Castlereagh's diplomatic manœuvrings. Napoleon helped of course by invading Russia. But then it has always been British policy to endure until the other side makes a fatal mistake. Winston Churchill was wont to recall with glee the story of the two frogs who jumped into a pail of milk. One folded his little limbs in despair and drowned. The other fought for life and his struggles resulted in the milk being churned into butter so that he was able to step out to safety.

Doggedness is an essential part of the British personality, but it needs the complement of ruthlessness to be effective. Reichsmarschall Goering might have won the Battle of Britain if he had not been diverted from bombing British airfields to bombing London. He was provoked into that blunder by a British raid on Berlin on 26th August 1940 In fact the English *invited* retaliation on cities as the only way of saving their air bases. Similarly as the war drew to a close the devastating RAF raids on east Germany were not only a parting blow at the rapidly vanishing Third Reich but a reminder to the oncoming Russian allies of the awful power of Bomber Command.

An ability to 'think long' has been a blessed feature of British political life. Because of the stability of English poli-

ticians (in the art of government the Scots, Welsh and Irish cannot compare with the English) families have been allowed to take root and grow to responsibility: the Pitts, the Cecils, the Churchills. They have thrived in an aristocracy of birth which has readily come to terms with popular rule. This 'bridging operation' has been made all the easier by the existence of the Throne acting as a focus for loyalty and buttressing the hereditary principle which, with all its manifold weaknesses, has mitigated the effects of too severe change.

So, presiding over the parliamentary scene, with its shifts of party influence, its sudden gusts of social reform, and curbing, however discreetly, the temptation of a newly elected majority rejoicing in a huge popular endorsement to alter the ground-rules of fair play, is the Monarchy.

Chapter 2

THE ROYAL FAMILY

The Queen has virtually no power to institute political measures herself, but she can stop others doing them. Her signature is required to make Bills law. The armed forces swear allegiance to the sovereign. In a moment of absolute crisis, the 'Patriot King'—or Queen—could be the nation's ultimate safeguard against tyranny masquerading as 'the will of the people'. It is never likely to come to that pass, for, if it did, the nation's genius for compromise would have collapsed and the British would not be the British any more.

Much closer to reality is the Monarch's role in advising Ministers on a course of action or dissuading them from one in private informal discussions. For it is then that the strength of the Crown is seen to best advantage. Over the past two centuries the average reign of a British sovereign has been twenty-two years, ranging from the sixty-three years of Victoria to the eleven months of Edward VIII. With the years has come an instinct for what is practical and desirable and what may be desirable but is hardly practicable.

Prime Ministers normally have a political life of some five years. So the Sovereign, with an adequate degree of shrewdness and perhaps fifteen years of experience, has much wisdom to impart, and the sensible politician acknowledges the fact.

Experience is the most important quality in the Sovereign's service to Ministers. Generally speaking, the longer the wearer has the crown, the surer is the guidance.

When Neville Chamberlain resigned office in 1940, with his appeasement policy in ruins and the German Army triumphantly overcoming the Allies, the King, then George VI, favoured Lord Halifax as successor. Happily Halifax, realizing he could not possibly command sufficient support

in the House of Commons – as a peer he did not even have a seat there – bowed to the one man who could save Britain: Winston Churchill.

At that point George VI had been on the throne only three years. He had not been trained for the job and had taken over in sad and strained circumstances when his brother Edward VIII abdicated. The King did not know Winston Churchill, who had been in opposition to the Chamberlain ministry. The King *did* know Halifax as an upright, Christian gentleman: which he was. He was not, however, the man who would take on the terrifying phenomenon of Hitler's Germany.

Five years later when Clement Attlee was forming his administration the King strongly recommended Ernest Bevin for the post of Foreign Secretary instead of Hugh Dalton, whom Attlee had initially selected. For five years the King had been able to watch the performance of both Ministers—Labour representatives in the Great Coalition—and had judged that the robust, no-nonsense character of trade unionist Ernest Bevin was far better suited to cope with the perils of the post-war world than the over-ebullient, unstable intellectual and former university don, Hugh Dalton.

Prime Minister Attlee, who had had the opportunity of weighing the King's judgment before, accepted his Sovereign's advice and appointed Bevin to the Foreign Office. Dalton received the Chancellorship of the Exchequer, from which post he resigned two years later following a Budget leak.

These two incidents illustrate the benefit of having at the summit someone who gives continuity to the nation's affairs and who is above the day-to-day wrangles. It demonstrates something else: the remarkable versatility of the British constitutional system. In theory Ministers serve the Crown. They are supposed to advise the Sovereign in whose name all Acts of State are committed. In fact authority resides, of course, with the party which commands a majority in the House of Commons. But because the Crown is permanent, and its holder likely to open several Parliaments, the party

chiefs listen closely to proposals from the Monarch and draw upon the accumulated knowledge of one who has frequently faced problems to which a newly appointed Minister is a stranger. Thus the positions are reversed: the Monarch serves as counsellor to the Ministers.

If, as seems probable, Queen Elizabeth II enjoys a reign approaching in length that of her great-great-grandmother Victoria, her influence on future generations of young politicians will surely increase, providing ballast to the Ship of State. Apart from constitutional duties, the Queen and the royal family have performed a quite outstanding task for Britain at a time of flux when nothing seemed secure and traditional values have been relentlessly questioned and generally derided. King Farouk of Egypt once said that the day would come when there would be only five kings left: the King of Hearts, the King of Clubs, the King of Diamonds, the King of Spades—and the King of England. While the sentimental attachment of the people to the throne was not in doubt, the relevance of monarchy as an institution was sceptically viewed and had few intellectual defenders.

This was the situation when Queen Elizabeth celebrated the tenth anniversary of her accession in 1962. Public opinion in Britain was inclined to regard President John F. Kennedy and his wife and children as the 'first family' rather than the Royals. For the Kennedys represented power as well as glamour. Their modern image, unencumbered by tradition, and their elevation to office through the will of the people instead of by birth, seemed more in tune with the contemporary world than the pomp and circumstance of Buckingham Palace. Moreover the substance behind the glitter of royalty had shrunk. The Monarch presiding over a worldwide empire was an object of veneration; the Queen attending a banquet of Commonwealth politicians who had but some few hours before been berating one another had not quite the same effect.

Now, however, the high office of President has been severely shaken by the scandals of Watergate. Once again the value has been demonstrated of a head of state above

party politics and its sometimes shady tricks. Indeed the Royal Family has shown itself ideally suited to meet the challenge of these post-imperial times. The Queen could be unquestionably royal while demonstrating the best attributes of wife and mother. Prince Philip, technically minded, vigorous, a mite abrasive and certainly no lover of fools, reflected the 'go-go' atmosphere of the age. He was not universally popular largely because, like Victoria's Albert, he was of foreign extraction, but he was vastly admired. Princess Margaret brought contact with the artistic world, as her choice of husband, the photographer Lord Snowdon, signified, and the whole royal scene was given continuity and unity by the enormously well-liked Queen Mother: the kindly, affectionate, clever, sensible Scotswoman at her best.

It was the *family* combination which was unbeatable. No one individual could have combined these virtues, for one cannot be gracious *and* cutting; dignified *and* deflating. Only the family with the Queen at its head could accurately mirror the nation's expectations.

The hardest task of all was encountered by the Queen's two elder children Charles and Anne. They had to meet the new generation head on. For them there could be no leisurely preparation: they had to speak and live out their youth under the fierce light that beats upon the throne.

Both met the test superbly. Prince Charles, with quiet humour and a stubborn resolve not to be ruffled, greeted student power advocates and Welsh Nationalist extremists with equanimity. He showed himself to be a many-sided character: formidable at polo, a competent rugby player, an excellent speaker, a fair student, a whole-hearted Prince of Wales.

While her brother won esteem as heir to the throne, Princess Anne discharged her own duties with flair and panache. From visiting orphanages to attending pop musicals she blended modernity with dignity as was further demonstrated when she married a commoner, Captain Mark Phillips.

In a world increasingly subject to spasms of political and social lunacy the British towards the end of the sixties began

to realize how lucky they were to have at the centre of affairs an institution of unchanging value.

Whereas in America, France and other lands political hatreds concentrate on the head of State, who is often unable to move without an army of soldiers, police and secret servicemen, the British Sovereign moves freely among her subjects. Of course there is danger of assassination, since there is no absolute security for anyone against a madman. But the Queen is above the party struggle. She is the ultimate court of appeal to which petitions for mercy and the remedying of grievances are addressed. Her Government can frequently do no right, but the Queen *can do no wrong*. This is the legal fiction on which the fact of British stability is built. The throne is unaffected by the increasing cynicism concerning politicians and their policies.

Dermot Morrah [1] has written:

> The British Monarchy in its deeper meaning for the British peoples is scarcely a system of government at all. It is their way of life. As such it is necessarily popular; it is always changing and always the same; and it is always up to date....
>
> The Queen represents universality. She is the embodiment of the whole life of the people: she presides indeed over its political action, but only because politics are one of the necessary departments of life, and of all departments she is the head. . . . *Her essential function is less to exercise power than to keep power in its proper proportion to the totality of life* [authors' italics].
>
> By the ceremonial behaviour demanded of Ministers in her presence they are reminded at every turn that their authority is a form of service; that which they serve is the people, made visible in the Queen. And the Queen, who is less powerful than the Ministers, is nevertheless more important. Every time a commander-in-chief stands and salutes her, or a Prime Minister presents his humble duty and begs leave to explain his policy, he is reminded

1. *The Work of the Queen*. William Kimber, London 1958.

afresh that authority has to be exercised with humility. This is the great British security against any danger that a successful soldier or popular statesman may begin to mistake himself for the source of his own authority, and so fall into the habit of thought by which dictators are made.

As political theory after theory falls to the ground, and each universal solution for mankind's woes is found wanting, so the greatness of the British system is more truly appreciated. The distance which the Sovereign maintains from all her subjects lends enchantment. The closer acquaintanceship of people with politicians leads to swift disillusionment. For politicians are concerned only with power, however much they may dress up their ambitions. That is why they 'press the flesh' (to use Lyndon Johnson's inelegant phrase). That is why they jostle and shove to get the limelight, why they promise the moon for votes. They are not all like that, but enough of them are to get the profession a bad name.

The most revered American President of recent times was General Eisenhower, who remained as far as he could above the party strife and came closest to being a constitutional monarch. Many snide remarks were made by his critics in the late fifties. The White House was scathingly described as 'the tomb of the well-known warrior'. Ten years later, when he died, Americans acknowledged the service he had rendered in bringing majesty to the office of President.

Full majesty, however, is a permanent feature of the British scene. It belongs to the throne from which honours flow to those who have distinguished themselves in national life. Now that the politicians, by an extraordinary act of self-denial, have practically taken their fingers out of the Honours till, the system is once more making good. But this social register is merely one function of the Crown.

The Sovereign is the source of justice, and the leading practitioners of the law are dignified by the title 'Queen's Counsel'. Certain scholars are 'Regius professors' and the

'Royal' is granted to learned societies, charities, foundations.

By virtue of their character the British have created a constitutional system which can 'roll with the punches' of destiny. The Monarchy is the supreme example of this talent. And the Monarchy most truly reflects the national passion for fair play, which is the basis of Britain's reputation for being the home of the Rule of Law.

Chapter 3

THE RULE OF LAW

No one would be rash enough to claim that British justice is always and in every way superior to that practised in areas outside the United Kingdom and Her Majesty's Dominions beyond the seas. But most of the time it is.

Again the peculiar history of the British explains their genius for law. The arbitrary power of the Sovereign was curbed by countervailing forces—barons in the thirteenth century, squires and merchants in the seventeenth, moneyed magnates thereafter until the dawn of fully representative democracy. But at no time—with the ten-year exception of Cromwell's Commonwealth—was the system wholly dislocated. So there was continuity. And continuity breeds respect for the rulers. Indeed the short rule of Master Cromwell's major-generals provided the most potent antidote against any desire to drag everything up by the roots again.

Largely secure from political patronage, the British judicial system has become the envy of the world; or rather not so much the system as the spirit underlying it, which is informed by a passionate desire for fairness.

The laws have reflected prevailing social attitudes: the game and property laws of the eighteenth century and those aimed at preventing militant trades unions in the early nineteenth century were openly discriminatory. Their purpose was to uphold the established order. That said, however, the fact is that justice as between man and man is very precious in England. And the British have transmitted this sense of justice to the lands where their own people are the dominant strain: to Canada, Australia and New Zealand; and to Asian and African countries of the Commonwealth.

The law of England (Scotland has her own) is a mixture of common law, custom, precedent and statute. There is no

code of English law—the law today being contained in about 3,000 Acts of Parliament, thousands of statutory instruments and rules and orders and over 300,000 reported cases.

After the Norman conquest in 1066 the King's judges gradually welded the many and varied local customs into a single body of general principles which they uniformly applied, first during their periodic circuits through the shires and later at their meetings in London to hear cases at the royal courts. In order to achieve consistency, the judges placed great reliance on previous judgments given in similar cases, a practice which gave rise to the doctrine of judicial precedent upon which all law in England, other than legislation, is based. It is likely that the necessary information was at first passed from one judge to another through personal contact, but towards the end of the thirteenth century some unknown persons began to note down and circulate the rulings of judges both on circuit and in the royal courts, and also the arguments of pleaders, as barristers were then called. These notes were contained in Year Books, which covered the period 1283 to 1535 and were the forerunners of the published Law Reports that have existed in one form or another for more than 400 years. The laws made by Parliament, of course, overrule all others. But the politicians would not long get away with Acts which deny natural justice. They would be soundly thrashed at the polls.

At the head of the English legal system stands the Lord Chancellor. He is a political figure; the leading legal luminary of the party in power. He sits on the woolsack a symbol of what in the past represented England's wealth—in the House of Lords and his office is responsible for the appointment of Justices of the Peace who maintain the Queen's writ at the grass roots. Justices of the Peace (J.P.s) themselves are local figures of repute, frequently local councillors, who sit on the Magistrates' Bench. Thus again there is some political element in the composition of magistrates. But it is not overwhelming, and as there is no great clearing out when one party takes over from another there is, once more, that

continuity of service which is a most admirable British custom.

The Lord Chancellor, the Attorney-General and the Solicitor-General are political appointments. Those apart, the men who administer justice, from stipendiary magistrate to Lord Chief Justice, are independent of the Executive. The Courts of England are as follows:

Judicial Committee of the Privy Council. Grand-sounding in title, its stature has been somewhat diminished by the decision of successive Commonwealth states not to use it as the ultimate court of constitutional jurisdiction. It comprises the Lord Chancellor, the Lord President, ex-Lords President, Lords of Appeal and such other members of the Privy Council (advisers to Her Majesty) who have held high judicial office. This includes eminent Commonwealth lawyers.

In England the supreme judicial authority rests with the House of Lords, which is the final court of appeal from all courts in Great Britain and Northern Ireland excepting only criminal cases in Scotland. This court is composed of the Lord Chancellor and ten Lords of Appeal in Ordinary.

The House of Lords itself has been steadily stripped of power since the Parliament Act of 1911 and is now a shadow of a shade. Its glory as co-equal partner of the Commons has departed. Yet it sustains an active role in the interpretation of the law and the dispensing of justice.

Four major divisions cover the work of the judiciary: the Court of Appeal headed by the Master of the Rolls; the Queen's Bench Division presided over by the Lord Chief Justice which transacts marine matters and commercial business in an informal atmosphere; the Chancery Division which among other things deals with contentious probate cases; and finally a new Family Division which covers divorce, non-contentious probate cases, wardship, guardianship and adoption.

Below these august bodies are the county courts, presided over by county court judges, and the magistrates' courts in which selected volunteers aid the stipendiary, or paid, judges.

The criminal side of English law is best known from the Central Criminal Court in London, the Old Bailey (so called from the name of its street), presided over by notable judges chosen from a panel including the Lord Chief Justice and judges of the Queen's Bench Division. The court also has present the Lord Chancellor and the Lord Mayor of London. Crown courts cover the whole country.

Scotland has her own legal system, which is based largely on Roman law. There are two political appointments: the Solicitor-General and the Lord Advocate, the latter initiating criminal proceedings and, if he so decides, restricting the pains of law – moving the court to impose a lesser sentence. Sheriff courts cover roughly the same ground as English magistrates' and county courts. There are more than fifty such courts in Scotland, dealing with cases ranging from arguments between neighbours to manslaughter. In contrast with England there are no coroners in Scotland; all inquiries into sudden death are conducted confidentially. So are committal procedures. Also in contrast with England there is no preliminary trial. Scottish juries number fifteen against England's twelve – and have long returned majority verdicts (it must be at least ten against two south of the Border) including the sardonic 'Not Proven', which is often taken to mean: 'We know you did it but we can't prove it.' At the summit of Scottish justice stand the eighteen judges of the Court of Session, who don different robes to become the High Court of Justiciary to try criminal cases.

In Northern Ireland too there are differences from English legal procedures.

What is significant about the legal process in Britain is its diversity and the degree of local attachment to and participation in the functioning of the system. This helps to buttress the precious separateness of the Judiciary from the Executive.

Promotion to the Bench comes through merit in the eyes of one's fellows and the approval of the Sovereign acting on the recommendation of her Ministers. Naturally Labour

Ministers are likely to favour Labour-inclined lawyers and equally Conservatives are prejudiced in favour of legal Tories. In practice, the political opinions of judges matter little. Their independence and their lack of bias stemming from their professional integrity matter a lot. And to this independence they are fiercely attached.

If a judge criticizes arbitrary exercise of power by the Executive he will instantly command the attention of press, radio and television. Yet, respect for the courts is absolute. It is enhanced by the full-bottomed wigs of the judges and the shorter ones of counsel, by the royal coat of arms, by the gowns—black and blood-red. Here in magnificent panoply is the Rule of Law.

British judges may be tyrannical—like Jeffreys and the Scot Braxfield—or eccentric like those, notably Lord Darling, who could never resist a joke, but they are never bought. It may be that the awesome respect due to the courts and Her Majesty's judges is overdone. Journalists are well aware of what 'contempt of court' may cost them. Yet this inborn deference to the law is the main reason for the Briton's readiness to abide by the rules and, consequently, for an unarmed police force.

The prestige of the police in Britain is high compared with that enjoyed by the police forces of other countries. An opinion poll placed the police top of eighteen British institutions—with the trade unions at the bottom.[1]

Judges' rules govern the admissibility of evidence. They are treated in a common-sense fashion by the judge, who admits or rejects evidence as he sees fit. 'The essence of the thing is that the judge must be satisfied that some unfair or oppressive use has been made of police power,' as Lord Devlin put it in *The Criminal Prosecution in England*.[2] The condign punishment handed out to the small number of corrupted policemen is another reason for public confidence

1. Opinion Research Centre, May 1973.
2. Oxford University Press, 1960.

in the impartiality of justice. This feeling of the supremacy of the law over those who enforce it, administer it and make it undoubtedly creates a special atmosphere of confidence between public and police.

There is nothing particularly magical about the construction of the police system in Britain. The Metropolitan Police are subject to the Home Office The name 'Bobbies' comes from the Christian name of the Home Secretary who founded the first London force, Sir Robert Peel Elsewhere local police forces are subject to local authorities. In recent years police organizations have been merged to achieve greater efficiency, as the battle against trained, scientific criminals has taken priority over the advantages of local control.

Even so, the influence which is paramount is one of involvement in the community. The 'village bobby on his beat' is the ideal, although the village may be the City of London and the bobby is armed with a walkie-talkie pocket radio to summon assistance from prowling patrol cars.

This ability to marry the traditional to the modern, to make reality out of a legend, accounts for the extraordinary prestige of the police in the United Kingdom. The fact that he carries no firearms is an important element in sustaining public trust, and this is a calculated risk on the part of the police, which appears to have paid off. Despite a rise in violent crime from the middle 1950s onwards, the rate is still fractional compared with that in other countries.

The biggest test of the London police came in 1968–9 when they successfully rounded up two gangs which had been operating a vicious 'protection' racket. Breaking these gangs involved over 100 police in each case.

> The rewards for betraying police plans [to the gangsters] would have been enormous. Yet dozens of important criminals were arrested and the evidence marshalled against them, with the effect that police morale was considerably raised and organized crime in London received a severe setback.

Thus Peter Laurie in *Scotland Yard: A Study of the Metropolitan Police.*[3]

What strange unquantifiable mixture explains this aspect of the British Genius? The moderate climate which damps down the passions? Saxon solidity tempered by Norman discipline? One could make out a case for this on the grounds that the violent crime rate in Scotland and Ireland is much higher than it is in England. But it would fall flat when the Welsh figures were examined. For they confirm that the Celt can be as well-behaved as the Anglo-Saxon.

Historical forces working themselves out naturally, uninterrupted by foreign invasion, have certainly helped to fashion the British talent for law and order. Century after century the centralizing tendency of the Executive has been checked by independent forces, be it landed lords or Whig magnates. Out of constructive tension and local initiative has grown an acceptable code. As the American historian Professor Boorstin puts it: '"One thing at a time!"—might have been the motto of the ancient English common law. Proceeding warily and undogmatically from case to case, the common law was rich in the prudence of individual cases and adept at solving problems though poor in theoretical principles.'[4]

Climate, perhaps heredity, indubitably experience, have all gone to make the mould. And there is another element. Service.

From the time she acquired her second empire – the first, the American colonies, having unfortunately been mislaid - Britain consciously developed a tradition of service. At first this was confined to the products of the long-established public schools (initially grammar schools): Eton, Harrow, Westminster, Winchester. They trained the young sprigs of aristocracy to be conscious of their responsibilities as well as to rejoice in their privileges. They aimed to produce gentlemen: 'Manners makyth Man'. The commissioned

3. The Bodley Head, 1970.

4 *The Americans*, Vol. II: *The National Experience*. Weidenfeld and Nicolson, 1966.

ranks of the Army and Navy—frequently, though not invariably, bought—were filled with the products of the quality class, many from public schools. It would be wrong to imagine that an *élite* was being deliberately created for the better governing of the King's Dominions overseas. Rather the schools existed to give some learning to boys who were born into the governing class; there being no nonsense about democracy in pre-nineteenth-century England.

The thrusting innovators, inventors, engineers of the Industrial Revolution decided that their children should enjoy the education once reserved for the landed upper classes. So a new ethos was grafted onto an old system. The public schools instilling the doctrines of God, Queen and Country, of sportsmanship, of training for leadership, of team before the individual date from early Victorian times. Arnold of Rugby is the model of the stern but just reformer remedying the abuses of a more relaxed age. The emphasis on justice is important, for it probably influenced most of H.M. judges and counsel who were, almost without exception, products of the public school.

Many of the most famous of these institutions were created especially to cater for the new class of mercantile rich and gave effect to the philosophy of Christian service which permeated the outlook of Victorian pace-setters. Among the famed seats of learning which date back little more than a century—or less—are: Bradfield College, Cheltenham College, Clifton College, Cranleigh, Haileybury, Lancing, The Leys, Malvern, Marlborough, Radley, Rossall, Wellington, Wycliffe, the Scottish schools Fettes and Glenalmond and in Ulster, Campbell's. It is not the purpose here to prosecute or defend the public school system, but merely to identify its influence on the British character. The products of that system were the men who sat on Benches at all levels in the United Kingdom and throughout the British Empire. They governed provinces and administered law in jungle clearings. Impartial justice became an ideal which buttressed the universally held conviction of the Briton's natural right to

freedom, and the whole became popular in the concept of 'fair play'.

The standards of the public schools were passed on to the majority through boys' books, magazines and even comics. They remained immensely powerful character-formers And their effect on the British attitude to justice lasts to this day. This is what gives British law its special flavour. Pragmatism, Professor Boorstin's 'one thing at a time', could have degenerated into opportunism and produced an irresistible demand for a codified law on the lines drawn up for France by Napoleon Bonaparte. England was saved from this by the legislative remedy of abuses following the great Reform Act of 1832 and by the climate of opinion with its emphasis on fair play.

So the strands which go to make the English character go to make English law. Jealous refusal to surrender ancient rights; self-discipline which accepts the rules, service and fair play, growing into a code of honour in the nineteenth century. Without question the heritage of the law is the mightiest gift bestowed by Britain on the world. Wherever the British legal tradition has taken root it has provided lands with a strength and cohesion they would otherwise have lacked. Here without question is a manifestation of the British Genius that nations around the globe happily acknowledge.

In a world where change is constant, rapid, bewildering and ruthless this is a heritage of which the British people are entitled to be proud. It marches with another British gift, generously distributed over the globe: that of parliamentary government, founded on give-and-take.

Chapter 4

MOTHER OF PARLIAMENTS

On Tuesdays and Thursdays each week the British Prime Minister can reckon on answering 120 questions from Members of Parliament on the most varied topics, ranging from the state of council housing in his constituency to the amount of foreign aid disbursed in the last twelvemonth.

In the House of Commons he is, theoretically, no more than another member who has been selected by his Sovereign to form a Ministry which is answerable to the will of the House. He may, again theoretically, be dismissed at any moment by his Sovereign either as a result of her independent judgment or because he can no longer command a majority in the Commons. In fact the Prime Minister is a great deal less vulnerable to the vagaries of political life than theory suggests.

So long as he controls his party successfully and he has over 100 patronage posts at his disposal in the administration to secure loyalty—he may rule until the statutory period of five years is complete. Then he must go to the country. Only in the gravest political crisis, where the Sovereign and her advisers fear that the Premier is seeking to establish a dictatorship, would there be any question of terminating his office by unilateral action on the part of the Crown That has not happened and is not likely to happen.

So the Prime Minister remains one who wields enormous power. He can sack Ministers whenever he chooses. The Cabinet is, in truth, composed of *his* men. Though he may be obliged to accept leading party personalities in his Cabinet in order to pacify party sentiment he can so manipulate offices—denying power to one department, strengthening another that he is master of all he surveys if that is how he wishes it to be. Some premiers prefer to act as chairman of a

board of directors, rather than assume the 'Great White Chief' role. Others stamp personalities with such force upon their colleagues that the Cabinet seems to the observer to be of minor concern.

But whatever the personality of the man who holds the premiership he still must subject himself to cross-examination in the Commons. Consistent failure in the Chamber itself will so erode the support of his back-benchers that they will intrigue to have him replaced by someone else; which means that every time the Prime Minister rises to speak he is on test before a jury of his equals. He may think he is God's gift to the human race as policemen salute him, but in the Commons he cannot, he dare not, try to dodge the scrutiny of his fellows. He may deflect the darts of the Opposition, to roars of applause from his followers; he may be guilty of 'terminological inexactitudes' ('lying' being an unparliamentary phrase) to get out of tight corners. But he cannot tell the Commons to go and jump in the Thames.

During the Second World War Winston Churchill was closest to being a dictator than anyone in Britain since Oliver Cromwell. The country was more highly geared to and mobilized for war than any other, Nazi Germany included. Churchill was Premier, Minister of Defence and effectively Commander-in-Chief of the armed forces. Yet he was still, as he kept on insisting, the Servant of the House. And, well aware of the realities of parliamentary politics, he made sure of his base by accepting the leadership of the Conservative Party—the majority party in the Commons—despite his all-embracing post as leader of the Coalition.

'Stick to your party and damn your principles,' said Disraeli, who knew what he was talking about, for in the long winter of Tory discontent while Liberal free trade dominated Britain, he practically damned his party by sticking to his protectionist principles.

Parliamentary government in Britain rests mainly on the British character. Traditions are adapted to changing conditions. Pursuit of perfectibility is quietly jettisoned when it

conflicts with reason and reality. 'Give and take', 'Compromise', 'Consensus politics' are the terms to define the astonishing success of the British in the art of governing themselves. Like their empire, the British acquired their faith in a fit of absence of mind. They have never sat down and thought it out.

Certainly there have been books in abundance about political theory. Hobbes's *Leviathan*, Locke on Contract, Mill, Laski and others on representative government have, in different centuries, projected different thoughts. Each mirrored the problems of an age. But it is impossible to extract abiding principles, because Britain is not run on codified logic.

The peers in the House of Lords are indefensible on the grounds of pure democracy. They sit there and not one of them has been elected, and most of them have inherited their titles. The Lords not infrequently redeem the blunders of the Commons just because they do not need to look over their shoulders to the electorate, or to bow to the orders of the party whips who may expel MPs into political darkness if they refuse to obey party orders.

Nobody decreed that it would be a good idea to have a chamber of independents to revise legislation passed hurriedly by a partisan assembly. The present House of Lords 'just growed'. It may well alter its composition and powers in future in order to respond to new requirements.

The chamber of the Commons is too small to seat all 630 members. It was deliberately rebuilt so—the earlier building having been destroyed in an air-raid—to sustain intimacy of debate, that being considered more important than the comfort of the members. Mr John Smith, MP for the Cities of London and Westminster, was so repelled by the allegedly poor facilities that he resigned his seat in 1970. It is significant that more than 300 Conservative hopefuls offered to take his place.

No attempt is made to achieve an exact reflection in the Commons of the country's voting preferences. A candidate may be elected to Parliament even though he gets only 26

per cent of the votes cast in his constituency, the remainder being split three, four or five ways. In 1951 the Tories gained a majority of eighteen despite having polled 350,000 fewer votes than Labour.

In February 1974 Labour were the largest single party though polling over a quarter of a million votes less than the Tories. Small parties, notably the Liberals, who garner big votes but no seats by coming a good second in scores of constituences, claim with some justice that the system operates to their disadvantage. With more than six million votes the Liberals gained only 14 seats in 1974, whereas Labour with 11,661,488 got 301. What the system does do is to ensure that a majority is normally gained for one party and that the Queen's Government is effectively carried out. In 1974 despite the increased strength of the Welsh and Scottish Nationalist parties and the Liberal upsurge either of the major parties could have achieved an overall majority with as little as 40% of the total vote. On this occasion they failed to do so, but British Government still remains essentially a two-party system of strong majority government The multiplicity of political groups in their assemblies undoubtedly contributed to the total instability of France and Germany between the two world wars. Both countries have since rewritten their constitutional rules closer to British practice

For it is the *practicality* of the British in government that is most admired abroad. As with the Common Law, the British build on prudence and precedence. For everything there is probably an answer. Old titles are dusted down and given new meanings. The office of Lord Privy Seal is one which Mr Edward Heath held when he conducted the first negotiations for Britain's entry into the Common Market. Aggrieved Europeans pointed out that he was neither a lord, nor a privy nor a seal. Yet this sentimental attachment to ancient titles is itself a constant reminder of the continuity of government, which is part of the British genius. The robes, the resounding names, the elaborate procedure say in effect. 'Things have not changed so much. Other generations had their problems and lived with them.'

The Speaker himself is the embodiment of the British sense of fair play. He is selected by the House, generally from the party which commands the majority, but once he is seated in the chair he remains Speaker for as long as he remains in the House, regardless of changes in Government. And he is then expected to be, and to be seen to be, impartial. This indeed is the standard test of character which the British apply to a man: is he capable of being a just referee/umpire/judge/chairman? Strong and continuing partisanship is not a recommendation to public trust in England. Only in war time does the political warrior come into his own; in peace he is kept at arm's length.

That this is not always to the national interest has been made abundantly clear in recent years. Churchill's counsel before World War II was ignored because the very robustness of his views and the glittering anger of his language alienated the views of the central mass of voters faithfully reflected by their MPs and Prime Ministers. Ramsay MacDonald and Stanley Baldwin were no match for Hitler. They were not even a match for Mussolini. And yet in a curious way this weakness of England for middlemen who make a profession of tranquillity yields dividends. If Churchill had been a member of the MacDonald-Baldwin administrations of the 1930s he would have been tarred with the brush of appeasement. Most prophetically, Stanley Baldwin wrote in 1935 in a letter to Lord Crathorne: 'One of my biggest problems was whether to include Winston in the Cabinet. We may not get through this business [the growing European crisis] without a war. If we do have a war, Winston must be Prime Minister. If he is in now we shall not be able to engage in that war as a unified nation.'[1] Baldwin was giving rein to his instinct. This is another important aspect of British parliamentary life intertwined with the national character: a distrust of logic, of precision in argument, of cold reason and a fondness for feeling one's way to the right decision. Moderation and a sceptical attitude to sheer intellectualism are essen-

1. Keith Middlemas and John Barnes, *Baldwin*. Weidenfeld and Nicolson, 1969.

tial ingredients in making a success of democracy. A sense of humour helps too.

Parliamentary humour runs from the broad and wholly unsubtle shouts of 'prove it' to Ministers foolish enough to open their statements with the words: 'We of the Government are fully conscious . . .' to crisp, barbed comments like that directed at a hard-of-hearing member who was leaning forward to listen to the words of a particularly boring speaker: 'Why does not the Hon. Member make use of his natural disabilities?' A 'good House of Commons man' is one who will stand his opponent a drink in the Members' smoking-room after having ripped him apart in debate. And his opponent is also a 'good House of Commons man' for accepting. By such means are party acerbities softened and the machinery of government oiled.

Westminster—once a royal palace -might have been designed by history to remind Members that their burning grievances and wondrous solutions have all been seen before. The very stones have absorbed the past There is the place where Charles I stood trial; where Warren Hastings was impeached; where Gladstone strode and Disraeli mused. The Central Lobby is like a market place with constituents lobbying members or discussing personal problems.

There, just as back-bench MPs daily subject the Executive to questioning, so they themselves are subjected to the demands of their constituents The Commons are well named. This is in truth a working-place; as *The Times* of 1832 put it when the House was being rebuilt following a fire: 'It is better to have a compact chamber where business can be transacted by those who attend, rather than a large hall where gentlemen may lounge at their ease.'

Lounging there is, of course, putting one's feet up on the table, a distinction reserved for those who have 'arrived' either on the Government or Opposition Front Bench. It is a prized and hardly won honour, comparable to the privilege accorded prefects at school and mirroring the fact that Parliament has much in common with school, faults as well as virtues. At the 'Yah-boo' level—and some debates

scarcely rise above this—it is rightly scorned by the parliamentary reporters who record the House's activities for press, radio and television. Their censure and that of members of the public who have witnessed the House at its worst echo the criticism of generations long since departed. Nobody can better this for a diatribe against knavish politicians:

> You have dishonoured this place by your contempt of all virtue, and defiled it by your practice of every vice; you are a factious crew, and enemies to all good Government; you are a pack of mercenary wretches and would, like Esau, sell your country for a mess of pottage, and, like Judas, betray your God for a few pieces of money: Is there a single virtue now remaining amongst you? Is there one vice you do not possess? You have no more religion than my horse! Gold is your God: Which of you have not bettered your consciences for bribes? Is there a man amongst you has the least care for the good of the Commonwealth? You sordid prostitutes, have you not defiled this sacred place and turned the Lord's Temple into a den of thieves by your immoral principles and wicked practices? You have grown intolerably odious to the whole nation, you were deputed here to get grievances redressed, are not you alone become the greatest grievance? Your country therefore calls upon me to cleanse this Augean Stable by putting a final period to your iniquitous proceedings in this House . . . and which, by God's help and the strength he has given me, I am now come to do. I command you, therefore, upon the pain of your lives, to depart immediately out of this place. . . . Go, get out, make haste you venal slaves. Begone! So take away that shining bauble there [the Mace] and lock up the doors.

Thus spoke Oliver Cromwell—according to a contemporary broadsheet, price 2*d*.—on dissolving the Long Parliament. In the three centuries since then no one has surpassed his mode for sustained invective. Parliament and Crown both came tumbling down. And yet within a handful of years both were restored to glory and regained the affec-

tions of the people. During these centuries, however, affection has never degenerated into veneration. Always the sharp spur of criticism has punctured any tendency to over-blown self-importance—a besetting sin of the Member of Parliament.

Henry Labouchère said of the Commons in Victoria's reign:

> Some of them [MPs] enter Parliament because they have been local Bulls of Bashan and consider that, in the localities where they have roared and pawed the ground, they will be even more important than heretofore; some because they had a fad to air; some because they want to try climbing the greasy pole of office; some because they delude themselves they are orators; some for want of anything better to do; some because they want to make a bit out of company promoting; and some because they have a vague notion that they are going to benefit their country by their devotion to legislative business.

That is not a bad description of pretty well every House of Commons that has sat. Of course it is prejudiced and cynical. Yet the truth is that, company-promoting apart, the motives outlined by Labouchère are by and large the same today. What the House of Commons does is to absorb the current fads into the stream of national life and wash away most of the delusions.

Occasionally a House of Commons is particularly rancorous and objectionable because it holds a larger than normal number of fanatics Such a one was the House of 1945–50 when a great radical revulsion against the Tories put Labour into office with a majority of 200 seats. The country certainly wanted a change. But many Labour MPs approached their task as though possessed of a revealed religion. Unction oozed from every pore. Not surprisingly, that was the most violently criticized Parliament of modern times. Public opinion supported the social reform to which Labour was pledged, but disliked the odour of sanctity in which the reforms were carried out. So the people slapped

the Government on the back and booted it in the bottom at the same time. By 1950–1 the swing of the pendulum was in operation once again.

It is a remarkable fact that since 1832, the date of the first Reform Act which made the Commons dependent on the will of the people, power has been shared almost equally between the Conservatives and the radicals. The score is: Conservative seventy-two years; radicals—Liberal and Labour—seventy. During the same period the Democrats and Republicans in the United States divided power in similar proportions: Democrats seventy-two years, Republicans seventy years. The 'swing of the pendulum', along with most stable and civilizing elements in America, is an import from Britain.

This knowledge that they are only temporary custodians of the public trust prevents British politicians from getting megalomania. Just when William Ewart Gladstone thought he had the job of Prime Minister for life, someone threw a brick through his window in protest at his Egyptian policy: his policies were denounced as the desperate antics of an old man in a hurry, and the voters were informed that if he found an ace up his sleeve he would swear God put it there. He was duly put out to grass by the electorate. Winston Churchill observed of his own defeat in 1945; 'Having endured all perils, having subdued all foes . . . I was promptly dismissed by the electorate from any further concern in their affairs.'

There is, in the British personality, a built-in resistance to dictators, however benevolent, and prophets, however rational. So while they cherish parliamentary freedoms they do not think too highly of parliamentary servants. The politician has not been born who can expect hero-worship from the British public. Britain has not produced a Hitler, a Stalin or a De Gaulle; not even a phenomenon like Roosevelt, because it is against the grain for the British to give their allegiance to one man for more than about six years at a time. The Queen is the focus of loyalties, not her Ministers.

Not that the Monarchy is entirely free from criticism either. In Queen Victoria's golden reign posters proclaimed:

'God Save the Queen – for no one else will'. And the tradition of taking a swipe at royalty continues in the Commons when Mr William Hamilton, MP for West Fife, attacks the Queen's extravagance, and papers such as *Punch* occasionally smite the 'Royal Family Show'.

In recent years perhaps the criticism of institutions has gone too far, as national self-confidence has waned. Lord Penney, for long brilliant chief of Britain's nuclear defence industry, later of the Atomic Energy Authority and Rector of the Imperial College of Science and Technology of London, sagely advised his fellow countrymen: 'We always used to be noted for understatement. The difference is that in the past we never meant it.'

Years of retreat from imperial responsibilities bred a cynical disparagement of Britain's achievement in all fields. The inestimable blessings of political stability were downgraded, as impatient critics inquired if it would not be better to scrap the fuddy-duddy ceremonial of Crown and Parliament and go over to a sleekly modern presidential-style system. How much more quickly things would be done then, they claimed. What the critics fail to realize is that the British system can respond with incredible speed to a real challenge. Resistance to change comes from the instinct of the people, not the mechanism of administration.

Parliament has unlimited powers, and various devices are at hand to limit debate and secure the swift passage of legislation. But its devoted servants – such as Speaker Horace King – have stressed its principal role of guaranteeing personal liberty: 'If the House cherishes the individual it will be doing much even when it may appear to be doing little.'

Towards the end of his life one of the great parliamentary journalists, William Barkley of the *Daily Express*, who had reported the glories – and the follies – of Parliament for forty years, remarked:

> To vary the old phrase, I like to think that Liberty, deserting the world, left her last footsteps here in England. We in the Press Gallery will snatch and hold the ankles of that

goddess and we will imprison her here on this sacred soil. We will never let her go. For this is one of the league tables in which England has long stood at the top and long may she stay there.[2]

2. William Barkley to the Parliamentary Press Gallery, 18th December 1964.

Chapter 5

SERVICE BEFORE SELF

In a poll conducted in 1969 on the popularity ratings of occupations, civil servants jostled with lawyers at the foot of the table. It is not necessary to go far to see the explanation for this. 'Civil servants' represent 'THEM' in capital letters.

Members of Parliament are accessible to the public and on call practically twenty-four hours a day. They take infinite care in replying to constituents' letters, sometimes indeed – this in the case of Ministers – disclosing more information to the individual elector than to Parliament. MPs are subjected to barracking, heckling, abuse and the final verdict of the ballot box; likewise local councillors. The police – except to the criminal classes – are 'US'. So are the armed forces, which, Northern Ireland apart, have scarcely ever had to be used to support the civil power. But the civil servants are 'the faceless ones' who represent Authority. Nothing provokes fiercer indignation from the press than the suspicion that civil servants are abusing their power. Money spent on civil service accommodation or on salaries is resented bitterly.

'Whitehall', the London area in which State departments are congregated, is a term of abuse. Invariably civil servants are depicted in cartoons as pin-striped pinheads, forever shuffling papers from 'Pending' tray to 'Pending' tray when not engaged in drinking tea. A best-selling book *Parkinson's Law* (1958), by Professor C. Northcote Parkinson, lampooned the service with magnificent, jaunty gusto and created the immortal 'Parkinson's Law': 'Work expands to fill the time available for its completion'. A considerable residue of resentment for Government as an institution remains from the days when royal power was abused or the landed interest stood between the up-and-thrusting middle classes and political influence. As a result civil servants, the instruments of

'meddling at best, oppression at worst', are the objects of dislike.

Resistance to State extravagance—a legacy of Gladstonian thrift—'Saving the candle ends at the Treasury'—lingers on. Extraordinary frugality can still be witnessed in government departments. To quote the Fulton Committee Report on the Civil Service:[1]

> We have formed the impression that the Civil Service makes too much of a virtue of austerity and in some ways has allowed it to develop to the point at which the reputation and efficiency of the Service suffers from it. We find the shabby impression of many Government offices has a dispiriting effect. . . . It is absurd to see Permanent Secretaries keeping their personal towels and soap in a drawer of their desk and walking the corridors with them.

Such damage to dignity is not likely to be felt by the public at large, which resolutely refuses to distinguish between a Permanent Secretary and a shorthand typist; all are simply 'civil servants', and if any money can be saved on their cost, so much the better. Yet, in truth, the British are extraordinarily well served by their civil service. To quote the highly critical Fulton Report again (it is the most exhaustive inquiry into the service since the Northcote-Trevelyan reforms in the mid nineteenth century introduced the examination or merit system into Whitehall):

> To some extent the urgent need for fundamental reform has been obscured by the Service's very considerable strengths, notably its capacity for improvisation, aptly demonstrated by the speed with which new departments have been set up in the last four years.
>
> There are exceptionally able men and women at all levels. There is a strong sense of public service. Its integrity and impartiality are unquestioned. We believe that the country does not recognize enough how impressively conscientious many civil servants are in the personal ser-

1. June 1968.

vice they give to the public. It is of high importance that these and other qualities should be preserved.

Once again, as in so many phases of British life, incorruptibility and impartiality are the most outstanding features. Though there has been disturbing evidence of some corruption in local government in recent years, no such reproach can be levelled at central government. The service is wholly non-political. No posts change hands as they do in America—when the opposition party takes over. That is not to say that individual officials are not occasionally given preference because their views coincide with those of their masters. That does happen. Promotion is speeded up beyond the bounds of seniority. But if it were to occur too frequently the head of the Civil Service would soon be having a quiet word with the Prime Minister—and back-bench MPs and the press would be hammering Ministers unmercifully.

Thus the service can claim, justly, to be free from jobbery. Its former virtues are now said to be its present defects. Yet it is necessary to examine the qualities which helped Britain to govern a world-wide empire with a fraction of the number of officials who populate the Pentagon today.

The philosophy underlying the civil service from the mid nineteenth century to the end of World War II was that of the 'gifted amateur' Entrants to the Administrative Class, the top-rank layer which provides all the departmental heads and almost all Deputy Secretaries and Under Secretaries and Assistant Secretaries, were, and still are, virtually obliged to have university degrees, generally of first- or second-class honours. The classics were reckoned to give a man a good all-round background, to train his mind not for any special task but to think clearly, thoroughly and in the round. The credo of the leadership—Eton, Balliol, the Foreign Office—was 'effortless superiority'. The English class system was reflected in the service. The administrative class was for university men—and the Foreign Office and Treasury were generally believed to be reserved for the products of the better public schools and Oxbridge. Then came the executive class,

'chaps in trade' so to speak. And finally the clerical, composed of not-so-industrious artisans. So at least a prejudiced observer might have reported and it would not have been an entirely unfair description.

Let it be admitted that the system worked pretty well until the two world wars finished the Empire, and the Welfare State, plus the mixed economy, plus technology, demanded sweeping changes. Once more the British capacity to adapt showed itself surpassing strong. During the Second World War experts from outside were grafted onto departments, or in some cases almost took over.

Overnight Lord Beaverbrook and his merry men from industry, commerce and newspapers created the Ministry of Aircraft Production. 'Where I find organization I smash it,' declared his lordship gleefully. Older heads in Whitehall still shudder at the memory of the Canadian tornado. Yet the same civil service which included more than its fair share of stuffed shirts also produced men of transcendent ability who made the war machine work from scratch. From the muddle and confusion emerged one or two miracles: John Anderson (later Lord Waverley), civil servant supreme, overlording air-raid precautions and guiding the national economy, Sir Archibald Rowlandson at the Air Ministry, slicing through the red tape in which the service is thought to be bound to get the planes; officials responding to the brilliant flair of Lord Woolton, stores chief turned Food Minister.

When war was over the civil service—much of which had become a Welfare Service to meet wants previously considered in the private sphere -could not possibly revert to the old days. But it did take a long while to change radically enough to suit new challenges. Resistance to reform is the reverse side of British stubbornness, so useful in war and times of crisis. It is sometimes the price of impartiality. As the Fulton Committee says:

> One of the main troubles of the Service has been that, in achieving immunity from political intervention, a system was evolved which until recently was virtually immune

from outside pressures for change. . . . Indeed the Service is still essentially based on the philosophy of the all-rounder. The ideal administrator is seen as the gifted layman who, moving frequently from job to job within the Service, can take a practical view of any problem irrespective of its subject-matter in the light of his knowledge of the Government machine. . . . A similar cult of the generalist is found in that part of the executive class that works in support of the administrative class and also even in some of the specialist classes. The cult is absolute at all levels and is all part of the Service.

Fulton recommends:

All classes [there were in 1971, 1,400 sub-divisions] should be abolished and replaced by a single, united, grading structure covering all civil servants from top to bottom in the non-industrial part of the Service. The correct grading of each post should be determined by job evaluation.

The Committee also proposed:

The convention of anonymity of civil servants should be modified and civil servants, or professional administrators, should be able to go further than now in explaining what their departments are doing. . . . The fuller the information, the closer the links between Government—both Ministers and Civil Servants - and the community, and the smaller the gap of frustration and understanding between 'them' and 'us'.

Harold Wilson's Government accepted most of the Fulton recommendations. But it is safe to say that all the sweeping changes demanded will not be implemented. Reform, in the British way, will be more gradual than the harsh 'do-it-now' tone of the inquiry. And already, of course, without any formal instructions, the service was adapting.

Britain has always produced a rich crop of men and women eager 'to do the State some service': wide-ranging individuals, possibly with some private income, frequently

of high intellectual calibre, almost always of crusading zeal. Such were the social reformers: a noble army, including many illustrious names: Wilberforce, Shaftesbury, Florence Nightingale, Elizabeth Fry, Rowntree.

In the early part of this century there emerged the *organized* reformers: the men who decided that administrative machinery must be built to wage war on poverty, ill health and unemployment. Two men whose work pervades every aspect of the Western world's economic and social welfare policies were William Henry Beveridge and John Maynard Keynes. The Beveridge Report on Social Insurance (1942) and Keynes's *General Theory of Employment, Interest and Money* (1936) are basic to the philosophy of the mixed economy and enlightened capitalism. It is to this intellectual stimulus that the West owes its present economic wellbeing and compassionate concern for those who do not 'have it so good'.

Chapter 6

MAKER OF A NEW AGE

Only England could have bred a man like Beveridge. He was born into a household where service was part of the atmosphere. His father was in the Indian Civil Service, and many years later William was to write an account of those numberless individuals who gave their lives to running that vast sub-continent in a book *India Called Them* (1948). Richard Austen Butler was another significant social reformer—the founder of the 1944 Education Act, the basis of the English educational system—who was born in India of servants of the Raj.

To Beveridge belongs the credit for doing more than any other individual to create the Welfare State. To many it is not an unmixed blessing. Yet it is important to emphasize that, throughout his life and work, Beveridge never ceased to stress the need to mobilize the *volunteer* spirit in the British character. This, like the zest for fair play, is a vital ingredient of the British Genius.

Beveridge learned this early on. Having taken first-class honours in Maths and Classics at Balliol, Oxford, he became in 1903 warden of Toynbee Hall, a settlement in the East End of London. There civil servants, barristers, doctors did what they could with advice, training and treatment to improve the lot of the local population. In Beveridge's words: 'Such a place [Toynbee Hall] represents simply a protest against the sin of taking things for granted, in particular one's own social position or conditions.' The work, however, was too restricted, its effects too fleeting to suit Beveridge. In 1908 his chance came to make a permanent impression for the better on the lives of his fellow citizens.

Every forty years or so a great reforming spasm grips the British public. In 1868 it was Gladstone shaking away the

cobwebs of the long Whig oligarchy and opening the road to talent in the civil service. In 1906 the Liberal Government of Asquith, Lloyd George and Winston Churchill was busy reshaping Britain's society.

Again in the 1940s the English social conscience was pricked, and again by a remarkable twist of fate it was Winston Churchill who invited Beveridge to undertake the preparatory task.

First time round in 1908 Churchill was President of the Board of Trade and he invited young Beveridge to help him establish the national network of labour exchanges, and later to inquire into the prospect of national insurance in which Germany led the world. Beveridge was vastly impressed with the efficiency and comprehensiveness of the German system, and when he came to draft his own Report on the Social Services in 1942, the foundation charter of the Welfare State, the significance of his German experience was not forgotten.

Where his contribution was distinctively British, however, was in its insistence on utilizing the voluntary *élan* which had kept so many hospitals, medical and welfare services in being and, what is more important, humanized them as no bureaucratic institution could have been humanized.

Thus wrote Beveridge in his Report: 'The State in organizing security should not stifle incentive, opportunity, responsibility; in establishing a national minimum it should leave room and encouragement for voluntary action by each individual to provide more than that minimum for himself and his family.'

The basis of the Beveridge scheme was that every citizen of working age would contribute weekly on one insurance document for all his needs; unemployment, disability and pension. There was to be no Means Test and the Social Fund —sustained by subscriptions from employees, employers and the State—was to sustain the beneficiary so long as need lasted.

At the heart of Beveridge's thinking was this:

Benefit in return for contributions rather than free allow-

ances from the State is what the people of Britain desire. This is shown both by the established popularity of compulsory insurance and by the phenomenal growth of voluntary insurance against sickness, against death and for endowment and hospital treatment. It is shown in another way by the strength of popular objection to any kind of means test [bitterly resented inquisition to establish whether or not an employed person had a source of private income or even saleable assets; if he had, State aid was scaled accordingly]. This objection springs not so much from a desire to get everything for nothing as from resentment at a provision which appears to penalize thrift, of putting pennies away for a rainy day. Management of one's income is an essential element of a citizen's freedom . . . the insured person should not feel that income for idleness, however caused, can come from a bottomless purse.[1]

Now there, in essence, is the philosophy of the liberal Englishman believing in the virtues of self-help and self-reliance, yet concerned to see that no one is allowed to fall by the wayside and that all who have a claim on national resources have it by right of contribution rather than as a charity.

Here is no worship of the State as the Great Provider, but instead an attempt to use the State as an insurance mechanism to rescue those struck by misfortune. This is a peculiarly British approach: the edges are fudged; much ground is left open for manœuvre, and the manœuvring is going on to this day. At one time the advocates of the State as Santa Claus gain, at others their opponents, championing the cause of 'free choice', make headway. But no one suggests sweeping away what Beveridge built or making the State the sole means of insurance. The British genius for *middling* (not muddling) along is at work.

As Beveridge himself said: 'How central and united the public opinion of the British people is. Over a large range of public affairs broadly the same line is taken.'

1. *The Report on Social Insurance and Allied Services*, 1942.

So immense was the impact of Beveridge's report—a copy of it was immediately called for by President Roosevelt – that politicians of the two major parties became somewhat alarmed at the degree of popularity aroused by this previously retiring academic. Beveridge did not help his cause by addressing meetings up and down the country and signing sketches done of him by pretty girls on trains and tubes. Vanity took its toll and he was edged out of the driving-seat. As a consolation he received honorary degrees from the universities of London, Aberdeen, Birmingham, Chicago, Columbia, Melbourne, Oslo, Oxford, Paris, McGill, New Zealand, Pennsylvania, Brussels, Rotterdam, Brandeis. Such was the measure of his world-wide fame as the architect of Welfare in a free society. He later became chairman of two new town development corporations: new towns being an idea he had sponsored fifty years before and which private individuals such as Lord Leverhulme had gone some way to putting into practice.

The Beveridge heritage to modern Britain and the world is the combination of State and private insurance, a 'mix' which most people find wholly acceptable. Central to the British welfare system and unique in its comprehensiveness is the National Health Service, which derived from Beveridge's social philosophy and was put into operation—alas, with strong partisan political overtones -in 1948. In three Acts pertaining to England, Wales, Scotland and Northern Ireland all health services and appliances were to be provided free on demand. This has been considerably modified in the years since, charges being imposed—and frequently altered to meet changing economic circumstances—on artificial teeth, dental treatment, spectacles, prescriptions and surgical appliances. None of these charges cover the full economic cost of the service or goods provided. In addition, small-income households are exempt from fees.

Thus the Health Service is near enough 'free' in that those who use it pay little or nothing at the moment of use. Nor does the public subscribe more than a fraction of the cost through weekly insurance contributions. The bulk of the

Health Service is financed through general taxation. The service is available to all, insured or not, including visitors from abroad.

A considerable margin still exists for voluntary effort. For example, extra amenities such as a lounge for older patients, a playroom for youngsters, a recreation room for nurses may be financed by money raised by the League of Friends of a hospital. At Epsom a beauty salon is staffed, supplied and run by volunteer helpers for the mentally handicapped.

For visitors the British Health Service is like a gift from heaven: so much knowledge, experience, dedication on tap for no charge. For the natives too it is a gratifying contrast with the terrifying fees of the United States and the indifferent treatment of many parts of Europe. A pleasurable sense of superiority fills the Briton's breast. Yet it would be wrong to imagine that the Health Service is paradise. Its first political master, the fiery Welsh spellbinder Aneurin Bevan, was too intent on pressing home doctrinal equality. His successors, in both parties, have tended to economize in costs at the expense of doctors and nurses so as not to damage their electoral prospects with the tax-paying patients. This accounts for the high rate of emigration of doctors and dentists, their places being taken by medical personnel from the Commonwealth, whose underdeveloped homelands can ill spare their skills.

At the same time the spirit of service, which is such a strong feature of the British personality, leads many doctors to turn down lucrative offers from overseas in order to keep hold of a nobler principle. This aspect of the British outlook is very important, for it helps to explain what the Americans would call the lack of business motivation in many activities. The residue of service-before-self is a powerful counter to 'profit before all', even though it may have its disadvantages in the tough world of commerce.

Chapter 7

BRITAIN THE PEACEMAKER

In the ornate entrance hall of the Palace of Beit-e-Dinn in the hills above Beirut hangs a framed letter. It is the first exhibit proudly shown to visitors and it is a warning from Lord Palmerston to the local ruler that having earned the disapprobation of Her Britannic Majesty he can expect a visit from Her Britannic Majesty's warships. 'You have made your bed and you must lie in it.' And the letter concludes: 'Your most obedient servant, Palmerston.' The delight with which the Lebanese display the Palmerston missive is a clear indication of the high regard they have for the supreme exponent of gunboat diplomacy. It is as if to say: '*There* was a man!'

Until the end of the Second World War generations of British schoolboys and girls were raised on stories of magnificent disdain for rascally foreigners. Diplomacy was Victorian in its grandeur. It was Curzon sending the Indian Army into Tibet to protect imperial interests. It was Kitchener destroying the Fuzzy-Wuzzies to avenge Gordon. It was Salisbury telling the French Ambassador, concerning a piece of real estate in Africa which was a source of contention, 'I'm sorry but you [the French] will have to go.'

The embodiment of the English aristocratic tradition of service, descendant of Cecil, Elizabeth I's adviser, Lord Salisbury 'the great black-bearded Cecil' described his philosophy of government: 'There are the multitude, and there are the leaders.'

Such sentiments were widely held not least among the working classes who liked such aristocratic presumptions, revelled in jingoism, threw bricks at Gladstone's pacific views and exulted: 'We don't want to fight, but by jingo if

we do, we've got the men, we've got the ships and we've got the money too.'

Against this background of apparent omnipotence the shock of impotence after two world wars was heightened. In fact the authority, even of the Victorian era, was not quite as overwhelming as it seemed. The entire British Army which policed a quarter of the globe in 1870 numbered fewer than the American Army in Saigon in 1970.

What the British did possess was economic superiority. The flag followed trade: to India, Africa, Malaya. Imperialism was a projection of commerce. *The Times* asked: 'Of what use is India to England?' And answered: 'In calicoes and bitter beer. We fought and conquered for our export trade in cotton stuffs and pale ale. The Hindus find our calicoes so cheap and so comfortable that they buy them by the shipload; the Englishmen who guard and govern them find bitter beer a necessity of tropical service.'

Too neat and over-simplified, this answer none the less does go far to explain how a nation, puny in military terms, in resources and in manpower came to head the mightiest empire in history. A genius for finding markets and convincing the natives that it was in their own best interest to accept British protection was the major cause of England's expansion. By the late nineteenth century Britain had invested overseas approximately as much as her entire domestic industrial and commercial capital excluding land. One-tenth of her national income came to her as interest on foreign investments.

To defend these interests—and particularly the fabulous Indian Empire—was the prime task of British statecraft. The British did not curry favour with the 'subject races', but they did, usually, command respect. Much fun was poked in later years at the colonial blimps with their plumed hats and pukka habits. The joke lost some of its savour when the alternative to British colonialism was revealed as perpetual instability, fragmentation and war—in Nigeria, in the Middle East, between India and Pakistan.

In combining governorship with a fair measure of political

and economic freedom the British in their empire accomplished far more than they have been credited with. They also developed that remarkable flair for diplomacy which, although it has sometimes deserted them, has so far always come back. Without question British diplomacy was at a terribly low ebb in the 1930s. In that, it simply reflected the mood of the country—apathetic, fearful, gripped by a pacifism that paralysed the will. British blindness went a long way to causing what Churchill described as 'the unnecessary war'. But British alertness helped to create the conditions for the survival of freedom in Western Europe after the war.

Long before the 1939 45 war had ended Churchill had perceived the danger from Russia: a danger of which President Franklin D. Roosevelt was blissfully unaware. Churchill moved British troops into Greece to forestall a Communist takeover in the winter of 1944. He pleaded – in vain – with his American allies for a strategy which would encompass the occupation of much of Eastern Europe before the Russians got there. In 1946 he startled the world by castigating Russia as a menace to peace, and employing the phrase 'Iron Curtain' in his famous speech at Fulton, Missouri, to describe the policy of Stalin in Eastern Europe.

Attlee and Bevin, inheriting Churchill's policy, struggled to build Western defences. Western European Union, a British-inspired organization linking the United Kingdom with Holland, Belgium, Luxembourg, France, Italy (and later Federal Germany) in a military alliance, predated NATO and was the first example of a united European effort to preserve the West. It was Britain which initially shouldered the burden of air-lifting supplies into West Berlin when that city was blockaded by the Russians in 1948. Exhausted by war, in the process of dismantling an empire in the face of a hurricane of Afro-Asian nationalism, bedevilled by economic crises, Britain still played the leading part in stirring resistance to aggressive Soviet designs. True, the Americans appointed the Supreme Commander of the North Atlantic Alliance. United States nuclear power underpinned the whole structure. But it was British persistence, foresight

and readiness to sacrifice which opened American eyes and persuaded the Americans to back Europe. Neither Churchill nor Eden—nor Attlee for that matter—believed the Russians to be incorrigible adventurers who would plunge the world into war to realize their objectives. As Churchill observed, Russia wanted not war but the fruits of war.

So it was once more a British initiative which got the ball rolling for that series of summit meetings which took the heat out of the international situation in the fifties. Churchill, leading the Opposition in the 1950 election, called for 'a parley at the summit' of the world's leaders. Having roused American ardour for the defence of the West, he had, for the sake of world peace, to douse United States anti-Communism. Thus he supported Attlee in December 1950 when the British Prime Minister urged President Truman not to sanction the use of nuclear weapons in Korea, where American, South Korean and allied forces were reeling before a Chinese offensive.

It has been suggested that Britain's influence has been exaggerated. Yet it is a fact that Churchill and Roosevelt had reached an understanding not to use atomic bombs without the consent of the other partner. In addition, in 1950 Britain was America's only dependable ally. Almost certainly Attlee's advice buttressed Truman's natural inclinations. Even so it may have proved decisive at a time when Truman's Party, the Democrats, had suffered heavy losses at the poll.

There is certainly no question (see President Eisenhower's memoirs, *The White House Years*) that British moderation was effective in vetoing a proposal made by John Foster Dulles to aid the French in Indo-China, today's Vietnam, by loosing nuclear arms on the Communists. By then—1954—Britain was herself an atomic power and her complete refusal to sanction the use of these weapons proved decisive. The British policy from 1944 was to contain Russia and China; to show the Communists that the democratic camp was ready to resist, to counter subversion, but never to lose an

opportunity for specific agreements from which both sides could benefit.

The year 1954 illustrated this policy in action. It was a climactic year. The previous March Joseph Stalin died. His successors were unsure of themselves and fearful of being thought less militant, especially in Chinese eyes, than the dreadful old tyrant who had just passed away. Yet finally endorsing the Korean armistice in July 1953 they gave notice that they were not averse to a live-and-let-live policy.

Churchill and Anthony Eden, his Foreign Secretary, kept this hope alive by refusing to make the French defeat in Indo-China by the local Communist/nationalist forces cause for a confrontation between Communism and the free world. At the same time they worked for an accord which would recognize the realities of the situation and get the best possible outcome for the non-Communists of Vietnam. The result was the Geneva Conference arrangement under which Indo-China was split into four: Laos, Cambodia, North Vietnam (Communist-ruled) and South Vietnam (anti-Communist).

This pragmatic approach did not appeal to the Messianic United States Secretary of State, John Foster Dulles, who was apt to talk in doom-laden terms about 'massive retaliation' or 'agonizing reappraisal', He began to doubt Britain's reliability in the crusade against Bolshevism. He was justified in questioning British readiness to join a crusade for or against anything. He was wholly wrong in saying that Britain was wobbling on resisting aggression. Subsequent events in Vietnam have borne out the wisdom of the moderate British approach.

At the very moment when the Geneva accord was being achieved for Indo-China, Britain was winning the seven-year war against the Communist terrorists of Malaya. The emergency did not, in fact, end until 1959, but when it was finally brought to a close Britain had won the most important victory in the post-war world. She had shown that it was possible for an Asian people to defeat subversion with the help of white troops. It was a slow, heartbreaking business.

But the job was done. The British flair for 'getting on with people' paid off, as it did still later when Indonesia's effort to seize Borneo in 1962–5 was blunted and destroyed by a small number of British and Gurkha troops who won the hearts and minds of the villagers of this wild land. The British triumph led directly to the fall of the unbalanced Indonesian leader Soekarno and his replacement by military moderates who swiftly repaired relations with the West.

To return to 1954, however. Two more examples perfectly highlight the aim and purpose of British diplomacy, this time in Europe. Trieste, a town on the Adriatic, had long been a source of conflict between Italy and Yugoslavia. For years following the 1939–45 conflict it had been beyond solution because Yugoslavia had become Communist under Marshal Tito, and Italy had thrown in her lot with the West. By 1950, however, Yugoslavia, having broken with Stalin, was ready to listen to reason. By 1953 negotiations were launched under British chairmanship, often with Eden personally in control. No fewer than 426 meetings were necessary. Ultimately patience prevailed; the town went to Italy, the surrounding countryside to Yugoslavia. The palm of the peacemaker went to Britain. 'Step by step' was the Eden way. And 'step by step' had done the trick. Even more satisfactory was the decision of Russia to terminate her occupation of Austria and permit that country to revert to a neutral status. This again was mainly Eden's work.

Behind the very considerable success of the early fifties lay the fact that Britain had been one of the three major victors of World War II. Indeed Britain was the only nation to enter the war voluntarily and see it through to the end. She exercised an influence enormously greater than her military-economic power justified. But this was a wasting asset. There were not lacking Americans who resented England's claim to equal status in the Western alliance and to 'a place at the top table' with the United States and the USSR. Among the detractors of the United Kingdom was Dulles, who is reputed to have remarked that the British should realize that their true role was to act as an unsinkable

aircraft-carrier for America. Winston Churchill retired from the premiership in April 1955 at the very moment when West Germany became a full member of the North Atlantic Treaty Organization. Britain lost her outstanding statesman. Germany gained the status to which her position in Europe and her extraordinary economic recovery entitled her.

The Suez affair gave the critics of the United Kingdom the opportunity to put her in her place: that of a middle-stature power no greater than Germany or France. It is not part of this study to investigate the events of 1956 which led to the Anglo-French occupation of the Suez Canal, a vote of censure at the United Nations backed by both Russia and the United States on the British and French, and the humiliating withdrawal of the allied forces. Suffice it to say that the military operation was a huge, lumbering affair preposterously overloaded for the simple objective of evicting the Egyptians from the Suez Canal, which they had seized. The campaign was a cotton-wool business which brought discredit to the British Army and exposed British politicians to the charge that they were not only hypocrites but inefficient hypocrites.

The effect of the Suez fiasco on British policy was fundamental. It produced a complete recasting of British diplomacy, which had been based, for the previous decade and more, on the model of the three concentric circles, as it was described by Churchill: the Commonwealth, the special relationship with America and the geographical partnership with Europe.

But the special relationship with the United States and the unity of the Commonwealth (India, Pakistan and Canada had come down against the United Kingdom on the Suez affair) had been severely battered. A wave of anti-colonial sentiment was sweeping Africa. The Imperial Mission was clearly nearing its end. That left Europe. In 1957 Britain got a new Prime Minister, Harold Macmillan, and adopted the European strategy which was to try to pick up the pieces by using Europe as the instrument for exerting British in-

fluence, which Britain could no longer exert alone. This was 'the withdrawal to prepare for the re-launch'.

The British had begun building their own atomic bomb in 1946, when it became evident that the United States was not willing to activate the war-time agreement between Churchill and Roosevelt for the sharing of nuclear secrets. Attlee cleverly secured £100 million for development without his nosey left-wing militants realizing what was happening. By 1952 the bomb had been successfully tested. Five years later it was followed by a British H-bomb and a special division of the RAF, the V-bomber force, was created to carry the independent nuclear deterrent. Thus a major objective was reached: nuclear power comparable in effectiveness with that of the United States and USSR. Not parity, for the two super powers had gigantic arsenals, but sufficiency on the basis that with nuclear arms 'enough is plenty'. Britain suffered severely in the 1939–45 struggle. Geographically her small size left her with no illusions about her chance of survival in a nuclear holocaust. So she was – and is pledged to peace from that most practical and enduring point of view, self-interest.

As a nuclear power Britain was able to take the initiative on the suspension of nuclear bomb-testing which was poisoning the atmosphere. Her representative, Michael Wright, a subtle, wise and humorous individual, was ideally suited to the long, tiring sessions in Geneva where patience was apt to wear thin. This was the time when Harold Macmillan was anxiously exploring avenues for a consensus with Russia in the face of a rather bleak disbelief on the part of America that such a search was either admirable or profitable.

Harold Macmillan sought to dispel this miasma of distrust, first by a rather flamboyant mission to Moscow in the spring of 1959. This produced a certain thaw and was succeeded by the abortive Paris Summit of 1960, attended by Russia, France, Britain and America. No lasting effect was secured by this grandiose 'summitry'.

Much more effective was the daily slog at Geneva conducted by Sir Michael Wright and his team. Here too of

course negotiations were affected by sudden squalls on the international front: the failure of the Khrushchev-Kennedy talks in Vienna in 1961 and the Cuba crisis of 1962. But the gradual build-up in mutual trust over the issue of nuclear tests continued, apart from the occasional rows on other fronts.

These conditions were especially suited to the British genius for talking people into agreement—'jaw-jaw', as Churchill observed, 'is better than war-war'. As he had also given his opinion that 'Russian policy was a riddle wrapped in a mystery inside an enigma', he handed to his successors a clear pattern for British policy which was in effect this: 'Keep on talking; don't lose your "cool".'

From time to time Ministers would join the Geneva discussions on nuclear testing. One such junior Minister was Joseph Godber. Sir Alec Douglas-Home—who was Foreign Secretary from 1960 to 1963—has disclosed that it was Godber's information concerning growing neutral apprehension about the lack of progress which led Sir Alec to press Premier Macmillan for a decision. Macmillan sent a letter to President Kennedy, who concurred in the approach to the Russians for an immediate pact on suspending nuclear tests in the atmosphere. Shortly after there was signed in Moscow the first substantive agreement on limiting atomic weapons. It would be invidious for Britons to apportion credit for this achievement. Fortunately President Kennedy did it. In a letter to Macmillan he praised the British leaders' 'initiative and statesmanship which, more than any other, has led to this treaty'.

Kennedy had further good cause to appreciate British diplomatic wisdom. During the terrifying days in October 1962, when the Americans got irrefutable evidence that the Russians were installing missiles in Cuba only ninety miles from the Florida coast, he relied on it. The crunch in the missile crisis was reached when the Soviet Union dispatched further batches of rockets and the United States Government stated that they must not be landed and that those already in Cuba must be withdrawn. In the picturesque

language of the press and television it was 'eyeball to eyeball'. In truth, Khrushchev was pushing his luck and demonstrating to the Americans that if they could put missiles in Turkey, only a hundred miles or so from the Soviet border, the Russians could reply in kind.

Two men outside the United States Cabinet were constantly consulted during the ten days which climaxed this confrontation: the British Ambassador in Washington, David Ormsby-Gore (later Lord Harlech) and Harold Macmillan. The latter has recounted how he was woken at 5 a.m., midnight in Washington, 'so I lost a good deal of sleep during this period'. These two Englishmen (Macmillan is of Scottish descent, but with a background of Eton, Balliol and the Guards) stood closer to the President of America than did most American political leaders because they both had the temperament and experience to handle such a crisis.

It may be said that the British did not bear the responsibility for peace or war. That is of course true. Yet Britain was as deeply involved as the United States in the consequences of failure, which would have been catastrophic for the whole world. It was in the skilful manner of allowing Khrushchev to withdraw his missiles and to keep face that British advice was most effective.

But Britain's severe loss of power, if not influence, was a reality Hence the move to Europe. In its first phase it was a bungled operation. The Macmillan Government applied to join the European Economic Community, the Common Market, in October 1961. Many people in the United Kingdom believed the candidature was prompted by a wish to find an answer to Britain's economic problems by imposing an outside discipline on labour, thereby avoiding the obloquy of tackling the trades unions head on. Whatever the motives, the ploy failed. It failed not just because President de Gaulle applied a veto to negotiations in January 1963— and repeated the manœuvre five years later. It collapsed because it worked against the grain of the British people. The public, at that time, rejected the Market. An abortive attempt with strong 'gimmicky' overtones was made to join

the Market in 1967. Three years later a full and constructive venture was launched.

The 'European card' still did not appeal overmuch to the British public, but its attraction for pragmatists was overwhelming. It offered an escape from American hegemony. Premier Wilson, despite a subsequent somersault, put it quite plainly when he declared that if Europe did not unite economically her states would be mere helots, hewers of wood and drawers of water to the masters of the free world across the Atlantic. He included Britain in the category of potential helots.

More and more Britain embraced the cause of joint defence, industrial and transport projects with continental partners of which the Concorde supersonic airliner was the most spectacular example. Highly significant is the effort to encourage the formation of continental firms, irrespective of national boundaries. Only by doing this, it is argued, will it be possible for Europe successfully to compete with the industrial giants of America.

At the time of his 'Iron Curtain' speech Churchill realized that containment of Communism was only one strand in British policy. Binding the lands of Western Europe together was just as vital. Churchill deplored the rabid search for scapegoats which characterized the immediate post-war period and perpetuated the hatreds and divisions of Europe. The valiant foe of Hitlerism championed reconciliation with Germany once the fighting had ended. 'Where are the Germans?' he asked a gathering of European notables who were met to discuss the future policies for the Continent. At Zürich and again at Metz in 1946 he called for France and Germany, those hereditary enemies, to bury their rancour and combine for the common good.

Speaking in Amsterdam in May 1948 he declared:

> For myself I am not the enemy of any race or nation in the world. Russians, Germans, Japanese, we all understand their toils and their sufferings. It is not against any race or nation that we range ourselves. It is against

tyranny, in all its forms, ancient or modern, new or old, that we take our stand. Tyranny presents itself in various forms but it is always the same, whatever slogans it utters, whatever name it calls itself by, whatever liveries it wears. It is always the same and makes a demand on all free men to risk and do all in their power to withstand it.

We hope to reach again a Europe united but purged of the slavery of ancient, classical times, a Europe in which men will be proud to say, 'I am a European'. We hope to see a Europe where men of every country will think as much of being a European as of belonging to their native land, and that without losing any of their love and loyalty to their birthplace. We hope wherever they go in this wide domain, to which we set no limits in the European continent, they will truly feel 'Here I am at home. I am a citizen of this country too'.

But if we are to achieve this supreme reward we must lay aside every impediment; we must conquer ourselves. We must rise to a level higher than the grievous injuries we have suffered or the deep hatreds they have caused. Old feuds must die. Territorial ambitions must be set aside. National rivalries must be confined to the question as to who can render the most distinguished service to the common cause. Moreover we must take all necessary steps and particular precautions to make sure that we have the power and the time to carry out this transformation of the Western world.

Practical measures like the Western European Union and Churchillian promptings gave a great impulse to the movement for European unity. France and Germany *did* come together in the Schuman Plan for uniting their coal and steel production. This was the first real step on the road which led to the foundation of the Common Market in 1957. It would be absurd to claim that Britain was the originator of the idea of European unity. Churchill himself handed the palm to Henry of Navarre and his Grand Design of the seventeenth century. Moreover, successive British governments

took a chilly view of some of the economic methods applied by the Common Market—notably the highly protectionist agricultural policy—to sustain the Community.

What is undeniable is that without Churchill's percipience and the resolution of the exhausted British nation, plus America's wonderful generosity in providing the material resources for recovery with Marshall Aid, the new Europe would never have got off the ground. In another context Churchill had remarked 'Give us the tools and we will finish the job'. America supplied the tools for the refurbishment of Europe. Britain injected the will to resist the Communist threats which only a member of the European family, tied to the continent by the facts of geography, was in a position to do.

Both across the Channel and across the oceans Britain exerted a firm yet reasoned influence in the hectic, tumultuous post-war years. While the United States undoubtedly exercised overwhelming power in this period—and, of course, still does—the British contribution to keeping the peace has been far more valuable than has been allowed by gloomy pundits, forever insisting on Britain's loss of authority; rarely focusing attention on her real achievements at a time of awesome difficulty.

In the quarter of a century from the end of World War II Britain had to extricate herself from Empire, rearm against the Soviet threat which imposed a heavy burden on the economy and living standards, and sustain an international network of trade relations upon which her very economic survival depended. She liquidated her empire in the short span of eighteen years between 1947 and 1965, shedding the imperial purple with remarkable ease. Many expatriates stayed on in the countries they had come to love; for instance, in India and Pakistan civil and military servants transferred into business.

Throughout what had been the empire, Britain retained a remarkable degree of admiration and respect. Not infrequently the independent governments called on the United Kingdom for help. Tanganyika, Uganda and Kenya asked

British troops to come to their assistance when threatened by army rebellions in 1964. Ghana made abundant use of British advice following the overthrow of dictator Nkrumah in 1966.

Meanwhile Britain continues in a world role which her diplomatic gifts and four centuries of discovery, colonialism and pioneering equip her uniquely to perform. The International Trader Unlimited: sustaining the free economic system which her merchant adventurers nourished and which her greatest modern economist did so much to preserve.

Chapter 8

THE MAN WHO PROVED MARX WRONG

Modern capitalism owes practically everything to John Maynard Keynes. 'His control over the business cycle is probably the single most important factor in establishing dynamic and prosperous capitalism.' [1]

His is the enduring influence in the 1970s, as the American economist Robert Lekachman [2] makes clear.

> It has been said that we are all Keynesians now. In the main this is a justified if slightly hyperbolic claim. It is the final victory of a new idea to become the common, everyday property both of the learned and the laity, the mental furniture of business men, politicians and professors. Such has been the fate of Keynesian thought.
>
> More than a generation has elapsed since either Great Britain or the United States has suffered the mass unemployment, idle factories, business failures, mortgage foreclosures and black despair which once were the inseparable companions of apparently inevitable business-cycle depressions. For the majority of Americans and Britons under the age of forty, the Great Depression of 1929–33 is one of history's set pieces rather than an unpleasant personal recollection or a prophecy of similar events. The word 'depression' itself has lapsed from popular vocabulary and very nearly from the technical lexicon of the professional economist. In its place is 'recession', and most people expect their recessions to be brief, gentle and infrequent.

Like Beveridge, John Maynard Keynes was a wide-ranging academic, son of a university don, steeped in the inquiring atmosphere of Cambridge, sustained by a comfortable family

1. Andrew Shonfield, *Modern Capitalism*. Oxford, 1965.
2. *The Age of Keynes*. Penguin Books, 1969 edn.

income and by that unquestioned certainty of the future so characteristic of the Victorian era in England.

It was the time when, as Keynes himself wrote: [3]

> The inhabitant of London could order, sipping his morning tea in bed, various products of the whole earth in as much quantity as he might see fit and reasonably expect their early delivery upon his doorstep; he could at the same moment and by the same means venture his wealth in the natural resources and new enterprises in any quarter of the world and share in their prospects, fruits and advantages.
>
> He could secure, forthwith if he wished it, cheap and comfortable means of transport to any country or climate without passport or other formality, could dispatch his servants to the neighbouring office of a bank for such supply of precious metals as might seem convenient and could then move abroad to foreign quarters without knowledge of their religion, language or customs bearing coin wealth upon his person, and would consider himself greatly agrieved and much surprised at the least interference. But, most important of all, he regarded the state of affairs as normal, certain and permanent, except in the direction of further improvement. And any deviation from it as abhorrent, scandalous and avoidable.

The Wealth of Nations, bible of free enterprise, written by Adam Smith more than a century and a half before, had laid down the guidelines for what proved to be the greatest explosion of human talent and resource in history. The first Industrial Revolution was virtually a British creation. By the latter half of the nineteenth century British inventions and capital had changed the globe.

For a hundred years the British had been the most successful practitioners of free trade ever known. True, by the 1890s they were being overtaken in productivity by the Americans and the Germans. Yet England was still the hub of an

3. J. M. Keynes, *The Economic Consequences of the Peace*. Macmillan, 1919.

empire covering a quarter of the earth's surface. Every second ship on the high seas was British-built and British-owned. From the tramway system of Buenos Aires to the electricity grid of Bangkok, from the tugs on the Irrawaddy to the beef herds in Texas, the commerce and finance of the world owed almost everything to London.

Then came 1914 and World War I. Britain helped to pay for the war waged by her French and Russian allies. She sold off much of her investment – about £1,000 million worth in the United States alone. She emerged from the conflict in debt to America while those who were in debt to her either failed to pay or, in the case of Communist Russia, repudiated the obligation. Worse, the whole complex, fragile, delicately balanced system of free trade collapsed. In its place there emerged a series of hectic booms and melancholy slumps. Unemployment in Britain never fell below a million in the twenties and in the early thirties it rose to 3 million The United States had 13 million out of work. Germany had 6 million – and Adolf Hitler was the result.

It is hard to appreciate in the affluent seventies how close to complete breakdown the capitalist mechanism was in the twenties and thirties. John Maynard Keynes revived it and gave it fresh purpose. His contemporary Beveridge said of him and Britain: 'Happy is the land where a wise man can wield power simply because he is wise, although he has no support from any political group, or financial or trade union group.'

In this Keynes paralleled Beveridge. Both were 'loners', although they had loose affiliations with the minority Liberal Party. Both relied on unofficial contacts with Ministers, bankers and civil servants. Both had the sharp, brilliant intelligence to command an audience and enough money to be independent of patronage. In short their public life was the private network writ large, despite the fact that their views were often in conflict with the conventional wisdom of the time.

What Keynes tried to do between 1919 and 1935 was to oblige the monetary authorities in the West to grasp the fun-

damental change that had been wrought by the First World War. Theories and practices followed by two centuries of progress were no longer adequate. The automatic adjustment in international trade brought about by the operations of the Gold Standard—contraction of credit leading to a fall in prices and consequently a rise in exports when gold flowed out of a country; expansion of credit and a rise in prices leading to a drop in exports when gold flowed in—had been fatally disrupted by the war. More than that, the Gold Standard, when it occasioned deflation for balance of payments reasons, was an instrument causing unemployment. Statesmen, bankers, financiers, lofty advisers of governments were unwilling to recognize this. Back to normality was the slogan. And for fifteen years Keynes fought a losing battle against orthodoxy.

President Roosevelt called him in for consultations when the American 'New Deal' administration was formed in 1933. Roosevelt was impressed by Keynes's intellect, but disappointed to find he had no magic formula for instant recovery. 'Why, the man's just a mathematician,' he exclaimed.

In 1936, however, Keynes published *The General Theory of Employment, Interest and Money* and in a letter to George Bernard Shaw wrote: 'I believe I have written a book which will largely revolutionize — not, I suppose at once, but in the course of the next ten years—the way the world thinks about economic problems.' He was right. No book since Marx's *Das Kapital* has had such a profound influence on the world. It is significant that the three most important textbooks on man's material world, *Wealth of Nations*, *Das Kapital* and *General Theory*, were all written in Britain.

Keynes had written a revolutionary tract. But he was no revolutionary himself. He traced his ancestry back to the Norman Conquest and was proud of the family connection with the village of Milton Keynes. He had no false illusions: 'only individuals are good; all nations are dishonourable, cruel and designing'. Accepting that, he struggled to make sure that the least cruel and dishonourable nation — his own —should not lose in any bargain. Nor did he abhor the past,

for all its blunders. He exhibited, in a highly developed degree, that continuity of thought and instinct which is best and truest conservatism. 'Let goods be homespun,' he said, 'whenever it is reasonably and conveniently possible and, above all, let finance be primarily national. Economic policy should not be a matter of tearing up roots, but of slowly training a plant to grow in a different direction.'

The plant he sought to train was free trade, which had grown deep roots in the soil of England:

> Free trade stands as a banner and a symbol of fundamental reason and decency between nations. Free trade unbesmirched invokes old loyalties and recalls one of the greatest triumphs of reason in politics which adorns our history . . . yet one must not let one's own sense of the past grow stronger than one's sense of the present and the future or sacrifice the substance to the symbol.

So he tended to a pragmatic approach in which 'protection' using tariffs to diminish imports and to support domestic production—would play some part in Britain's recovery from depression. That was, however, only one element in the grand design. Savings, Thrift, Investment—the role of these he thought out anew. Were they, asked Keynes, necessarily virtues? For one thing, he maintained that saving (when you and I put money aside) and investment (when that money is *spent* by industrialists in new plant) were not identical. There might be an excess of savings leading to depression (this is largely what happened in the thirties) or insufficient savings leading to inflation.

> Thrift [declared Keynes in *Treatise on Money*] may be the handmaid of enterprise. But equally she may not. For enterprise is connected with thrift not directly but at one remove; and the link which should join them is frequently missing. For the engine which drives enterprise is not thrift but profit.

Profit was essential. But how should it be made? On the Stock Exchange?

Speculators may do no harm on a steady stream of enterprise. But the situation is serious when enterprise becomes the bubble on a whirlpool of speculation. When the capital development of a country becomes a by-product of the activities of a casino the job is likely to be ill-done.

Thus one of the most famous and telling passages in *The General Theory*.

No brief summary can do justice to Keynes's penetrating analysis of society's ills. What he wanted was not for the State to regulate people's lives (heaven forbid!), but for the State to promote those aspects of the economy which would respond to a central impulse. The multiplier effect of national investment could help to restore national fortunes—for example, the government loan which led to the resumption of work on the *Queen Mary* in 1933.

To convince his contemporaries, fellow economists, academics, politicians and officials that he was not a crank Keynes used mental courage and persistence. He tried ridicule, aiming with deadly precision at the Treasury.

If the Treasury were to fill old bottles with banknotes, bury them at suitable depths in disused coalmines which are then filled up to the surface with town rubbish, and leave it to private enterprise on well-tried principles of laissez-faire to dig the notes up again . . . there need be no more unemployment and with the help of the repercussions, the real income of the community and its capital wealth also, would probably became a good deal greater than it actually is. It would indeed be more sensible to build houses and the like; but if there are political and practical difficulties in the way of this, the above would be better than nothing.

Why not [argued Keynes] set people to work digging roads, canals, the foundations of factories and houses and so create genuine wealth? Call it public works or what-you-will but get men working and their earnings when spent will create further earnings for those making the goods they buy.

It was not merely that social tension leading perhaps to open class war would be caused by permitting income to accrue overwhelmingly to a small section at the expense of the broad majority. That was true and bad enough. But the economic implications were that uneven distribution led to hoarding by the wealthy whose propensity to consume was minuscule compared with the potential demand of many living on or little above the minimum.

Whether Keynes's ideas would have spread as swiftly as they did without the pressure for armaments and then the war itself is doubtful. He himself reckoned on ten years before his doctrines revolutionized economic thought. He was in intellectual command of the British economy -and wielding enormous influence over the Americans—within seven years.

The whole idea of regulating the British economy by varying the rates of Pay As You Earn (the system of deducting tax from the wage-earner at source) and the rates of purchase tax, the impost placed on a wide range of products at the wholesale stage of distribution, plus the project for deferring income so that it could be 'fed back' into the economy in the form of Post War Credits, sprang either directly from Keynes or from his teachings.

The remarkably high level of employment, production and consumption enjoyed by Western nations since the war flows from the official adoption by many governments of Keynes's theories and the ideas he helped to spread.

On international monetary affairs the effects of Keynes's thought and actions has been profound. Much of the war he spent commuting between London and Washington, firstly to establish close liaison with the Americans on securing American financial backing for the British war effort, later on building the post-war monetary world. He was obsessed with the need to avoid that shortage of 'liquidity', i.e. shortage of an internationally accepted medium of exchange, which had helped to cripple pre-war economies.

As early as 1932 he had advocated an international agency to print 'gold notes' or paper gold to a maximum of £5,000

million (quadruple for present values), distributed in proportion to national gold reserves as they stood in 1928, that is, before the great Wall Street crash. This was the precursor of the International Monetary Fund which regulates international finance today. He wanted parities—the price of one currency against another -to be fixed, but automatic adjustment (responding to supply and demand for a particular currency) to be made up to a maximum of 5 per cent. The dollar crisis of 1971 demonstrated that exchange rate fluctuations on this scale were feasible as has the subsequent floating of the British pound and other currencies.

In his war-time discussions with the Americans, which led to the Bretton Woods Conference in 1944 and the creating of the whole present financial structure in the world, Keynes frequently pressed for a genuine International Bank, a clearing union which would issue its own notes (Bancors) and overdrafts. Voting rights would be in proportion to one's share of world trade (this would today give Britain, Germany and Japan separately about as much say in international finance as the United States and together a great deal more).

The Americans, however, were shy of this bold, far-reaching project. Their Government had a very orthodox-minded and somewhat recalcitrant Congress to deal with and had no wish to provoke an unnecessary fight with it. Additionally, and more to the point, America was in such a strong position—by the war's end she had about 80 per cent of the world's gold reserve locked up in Fort Knox that she had no ardent desire to build international organizations In particular, the Americans resented Keynes's proposal that creditor nations should be charged interest on their balance of payments surplus if that surplus proved large and enduring.

Just such proposals were revived in 1969 to deal with Federal Germany's persistently large surplus on the balance of payments. America—with a continuing and growing deficit—was foremost in urging the course Keynes had once put forward in the days when it seemed inconceivable that the United States would be in anything but surplus. Keynes's

prescience was such that his promptings in the forties read like a text for the seventies.

> We need an instrument of international currency having general acceptability between nations, so that blocked balances and bilateral clearings are unnecessary. . .
>
> We need an orderly and agreed method of determining the relative exchange values of national currency units so that unilateral action and competitive exchange depreciations are prevented.
>
> We need a system possessed of an internal stabilizing mechanism by which pressure is exercised on any country whose balance of payments with the rest of the world is departing from equilibrium in either direction . . .
>
> We need an agreed plan for starting off every country . . . with a stock of reserves appropriate to its importance in world commerce, so that without undue anxiety it can set its house in order.
>
> More generally, we need a means of reassurance to a troubled world, by which any country whose own affairs are conducted with prudence is relieved of anxiety for causes which are not of its own making, concerning its ability to meet its international liabilities; and which will therefore make unnecessary those methods of restriction and discrimination which countries have adopted hitherto, not on their merits, but as measures of self-protection from disruptive outside forces.

Always his concern was to ameliorate, or if possible eliminate, the undesirable effects of capitalism without destroying the free enterprise system which he regarded as the essential engine of progress. No one should imagine that Keynes's ideas have all been carried out But his economic models are the standard test of measuring mass satisfaction in the Western world.

On full employment it is the Keynesian dictum that prevails: 'A job for everyone who is willing and able to work.' The Beveridge formula for a high and stable level of employ-

ment was a workless total of between 3 and 5 per cent.[4] For fully a quarter of a century after the war unemployment in Britain remained nearer the 1 per cent which Keynes wanted to achieve.

On the technical plane of aggregate analysis of the workings of the economy Keynes's theories have everywhere won acceptance. And it is probable that as the distribution of Special Drawing Rights, 'paper gold', becomes more general so Keynes's ideal of a true world banking system will come closer to realization.

Without question John Maynard Keynes was a more formidable personality than William Beveridge. One spawned a whole new school of thought: the other merely grafted social welfare onto an established system. Yet they are complementary. There could be no social security without the surplus created by the full utilization of all resources in the economy. There could be no technological advance, ensuring future full employment, without a safety-net for those who are victims of scientific and industrial progress. Keynes and Beveridge laid the foundations of the new Britain. They provided the mechanism and by their own incomparable propaganda wrought the transformation in outlook without which the mechanics would have been useless.

Both were staunch patriots. Beveridge frequently referred to his pride in being British. Keynes often embarrassed his literary friends in the Bloomsbury circle who liked to consider themselves 'cosmopolitan', although they were as English as tea and crumpets—by his devotion to British interests including, if required, the protection by tariffs of 'homespun industry'. His biographer Roy Harrod recalls that on the last day of his life: 'Turning a little he had a wide view of the sea from the Downs. This precious stone, England. He had faith in the British people. Their native energies and patience would not fail to bring back prosperity.'

Had Keynes been able to predict the future—he died in April 1946—even he would have been astonished at the

4. Sir William Beveridge, *Full Employment in a Free Society*. Allen & Unwin, 1944.

scale of change demanded of the British. But in adapting to change without straining the social framework to breaking point the British have shown an infinite capacity for bearing pains which amounts to genius.

Chapter 9

CASUALTY OF WAR

'We shall fight on the beaches . . . we shall fight in the fields and in the streets, we shall fight in the hills,' roared Winston Churchill in that memorable summer of 1940 and muttered later: 'God knows what with, beer bottles, I suppose.'

After five years of total war, Britain found herself up against the problem of making ends meet in peace time. And this time even beer bottles were in short supply! True, Britain's competitors, notably Germany and Japan, were in a far worse state. But perhaps certain advantages accrue from starting in a situation of complete devastation. There is nowhere else to go but up!

Lavish American aid from 1948 onwards, plus the discipline of free market economics, high prices spurring high production on the time-honoured principle of work or starve, plus the natural virtues of the German and Japanese peoples, ensured a recovery which was hailed as little short of supernatural. The *Wirtschaftswünder*, the 'economic miracle' as the Germans cheerfully termed it, passed Britain by.

The Germans bought, or hired, brand-new machines of the latest design for the simple reason that their old ones had ceased to exist. They were either flattened by bombing or handed over to the Allies in reparations. Ten million refugees poured into Western Germany from the Russian-occupied East. They were penniless. They were hungry They were skilled. They worked with a fantastic zest. Work was to the Germans not only a necessity but a substitute for everything else. It might be fanciful to suggest it was a way of expiating sins. It would be absolutely accurate to say it was an anodyne for defeat.

There were three other factors in the Germans' favour. Their trade union structure had been shattered by Adolf

Hitler who lumped all labour organizations into the Nazi Arbeitsfront. After the war they were restructured, on the advice of Ernest Bevin and the British trades unionists, into sixteen industry-wide unions. Demarcation disputes between small craft unions within the same industry thus became impossible. More, the German unions reflected economic realities whereas the British carried into the second half of the twentieth century craft representation, interests and disputes redolent of the nineteenth.

The second factor supporting German recovery was the inborn fear of inflation. Twice—in 1922 4 and 1946–8—the Germans had experienced runaway inflation. They were ready to endure anything: high unemployment, incredibly long hours, job mobility, to avoid a repetition. Fear of inflation was a prize incentive to work which no artificial creation could rival.

Finally the Germans embraced American-style materialism like a long-lost son. The Thousand Year Reich was gone. Germany was divided. Both parts were occupied by foreign troops. Germans were excluded from the counsels of the world. Very well. Germany would become rich. Wealth would be the measure of her talents and there would be no tolerance to political lunatics of the Left or Right who interfered with the strengthening of the D-mark. 'Keine Experimenten': 'No Experiments' On that slogan Dr Adenauer won four elections in succession. Dr Erhard, his Economics Minister, fashioned a philosophy, 'the social market' to associate German labour with the fantastic success of German industry. Twenty years after Hitler's suicide the D-mark was the strongest currency in the world. Twice it was revalued then allowed to float upwards. Twice the pound sterling was devalued and then the almighty dollar too.

Of course in 1945 one country dominated the globe, the United States She possessed four-fifths of the Western world's manufacturing capacity; four-fifths of its gold, the international currency; every nation was in debt to Washington, some hopelessly so. Finally the Americans had a monopoly of the atom bomb. It was a position of power

overwhelming and scarcely credible. Britain on the other hand had most of the commitments: an empire everywhere under attack from nationalists and forces aided by Communist subversion; a trade pattern geared to the depression-ridden thirties when, by the Ottawa Agreements, Britain undertook to supply the Empire lands with manufactures in return for providing a guaranteed market for the food producers of Canada, Africa, Asia and Australia.

British soldiers stood guard against Communist subversion in two-score lands. Yet the kitty was empty and the economy was at breaking-point. Britain's North American investments had been sold to help pay for the war. At one point - in June 1941 — the British gold reserve was reputably down to £3 million.[1] After the war a £1,000 million loan from America, admittedly on favourable terms, was negotiated. Britain, from being the world's greatest creditor, was well-nigh the world's record debtor.

Still more disturbing was the state of British industry. The railways, privately owned and starved of capital during the slump and overworked during the war, were in a desperately run-down state. The coal-mines were equally outdated. So was much of the engineering industry. And shipbuilding. And textiles. And steel. Memories of the depression created resistance to new machines and technological change.

Whereas in Germany industrial bitterness between capital and labour had been swamped in the common catastrophe, no such wiping-out process had taken place in Britain. Industry was very much a matter of 'two sides'. Unemployment was the bogy feared and hated above all else. 'A job for all' swiftly came to mean the *same* job for all time.

This slowness to adjust, to swing over from the old basic industries to the newer capital-intensive and science-orientated ones contributed to Britain's relatively sluggish economic performances in the fifties and sixties and to the demand that the United Kingdom hitch her fortunes to the fast-expanding European Economic Community.

1 See Lord Woolton: House of Lords debate on U.S loan, December 1945 (Hansard).

Figures were presented in 1970 to show that (1) in motor-car production France, Germany, Italy and Japan had moved ahead of Britain; (2) in shipbuilding Germany and Sweden were ahead in Europe (Japan had long since been in a class of her own); (3) in steel output, the United Kingdom had slipped well behind Germany. Japan, the United States and Russia were well out in front; (4) So far as students in higher education were concerned both proportionally and absolutely Britain was near the bottom of the league of major industrial powers.

These crude statistics—and many others—obscured rather than illuminated the true picture. Qualitative factors could, and did, counterbalance mere quantity. How do you measure the value of Christopher Cockerell who developed the hovercraft? Is he worth one dozen science PhD's? Two dozen BSc's? If coal is used more efficiently in new power stations to produce a greater amount of electricity per unit of coal does it matter if total pit production is falling? How can gross national product be accurately compared country with country when standards, customs, habits are so different? The British are not, as a whole, a people devoted to work as a worthy end in itself. The week-end is a national institution. Once it was reserved for the well-off employer class. Today it is general. The passion for sport, as spectators or participants, is so strong that work solely for money's sake takes second place.

Thus in a quantitative survey the United Kingdom emerges with an uninspiring economic record since the war, the reasons for which have been briefly outlined. But when *selective* inquiry is made a very different situation is revealed. And it is a heartening one.

Chapter 10

NOT FOR PROFIT ALONE

Bare statistics alone do not do justice to the extent of British shipping's influence on world trade, but they are an essential prerequisite to appreciating its scope.

Britain's mercantile marine is, at 21 million tons, the largest in the world. True, the tiny flags of convenience States—Panama, Liberia and so on—run her close and occasionally surpass her on registered gross tonnage. But these are false comparisons, for the actual owners of the vessels are Greek or American concerns who merely use Panama or Liberia as tax-free havens.

British shipping subscribes nobly to the balance of payments. From total earnings in excess of £1,000 million, made up of freight on United Kingdom exports, freight on cross voyages, passage money from non-U.K. nationals and time charter hire, almost £400 million net is paid in. The outgoing is for the purchase of fuel abroad, canal dues, port expenses and other disbursements and the hire of foreign vessels.

As with shipbuilding, shipowning has been severely rationalized since the 1930–33 slump. There are now four main groups: Peninsular and Oriental Steam Navigation (the biggest shipping company in the world. P. and O. has more than 250 ships with a total tonnage of nearly 3 million); Ocean Steam Ship Company; Cunard; and British and Commonwealth.

In shipping the old empire links hold fast. Routes to the Far East, Australasia, southern Africa are dominated by British lines. But it is naturally with cargoes that the shipping lines flourish. Here a major revolution has taken place -the invention of container ships. On the Australia run, for instance, containerization has meant that the number of ships

has shrunk from forty to nine and the speed with which ships can be loaded and unloaded has been cut from two weeks to forty-eight hours. As a result each ship can make twice as many round trips to Australia. The return on capital, which had been sagging badly in shipping, is approaching 15 per cent, considerably higher than the average for British industry. The typical container ship carries over 1,100 containers, which are aluminium-and-steel boxes capable of holding 20 tons of cargo. This compares with, say, 200,000 boxes, which had to be sorted into perhaps 250 'marques', or categories.

It is a tribute to British enterprise and acceptability that her shipping lines should still take precedence and that London should be the dominant voice in all the international conferences to decide rate structures. A feeling for the sea, allied to that relaxed self-discipline afloat which gives customers confidence, probably explains the continued good fortune of British shipping. Shipping companies are still very much family concerns. Sons follow fathers, both in the boardrooms and in the lower deck. The British love of service not of servitude—finds full expression in shipping and calls forth a mutual loyalty between employer and employee. Not that shipping companies are alone in that. Vickers, the large engineering concern centred at Barrow, is highly paternalistic. 'Barring accidents,' a senior executive told economic journalist Graham Turner, 'you're here for the duration. We don't kick people out who make mistakes. If a man makes one mistake you put your arm round him and call him a silly bugger. If he does it a dozen times then you give him a new job.'[1]

Welfare services are run by many concerns, but those with the family touch are most appreciated. Guinness spends £70,000 a year on its own health service and has been paying two-thirds pensions for seventy years. Cadbury and Rowntree—the Quaker family firms—have built model towns for their employees. Reluctance to sacrifice this atmosphere led the Rowntree trusts to reject a tempting offer from the

1. Graham Turner, *Business in Britain*. Eyre & Spottiswoode, 1969.

United States giant General Foods. Pilkington of St Helens, Lancashire, the largest family business in Britain (see p. 201) and the world's leading technologically minded glass company, bought the town's Theatre Royal to secure it for the town's workpeople, modernized it and subsidized it to the tune of £20,000 a year.

This attitude of 'our responsibility is to a way of life rather than to the shareholders' is summed up by Sir Tatton Brinton, the carpet manufacturer: 'We are here to make carpets as pleasantly as possible, and to make a profit without sacrificing the provision of a good and civilized life for the workpeople. Human beings are first on my list. I've always been well off and I don't want to make a million quid.'

This readiness to sacrifice the 'quick buck' for the family set-up has led to a tremendous growth of business 'umbrellas'. Thus a large number of family breweries huddle happily under the Whitbread cover. United Biscuits and Associated Biscuits are made up of a number of highly successful family firms which profit best through partnership. A former chairman of United Biscuits, Lord Craigton, has said it would be virtually impossible to amalgamate with another concern so fiercely do the constituent parts of United cling to their independence.

Although the modern application of voluntary chains for small retailers stems from the Continent particularly Holland – England took to the scheme with enthusiasm because it answered the need for independence. Some 20,000 shops, mainly grocers, grouped together to share a common wholesaling service, to help, from a central fund, the refurbishment of their premises and sometimes their conversion to self-service. The impetus for this reform came from the immense inroads made into the market by the supermarket chains in the fifties. But the response was more than a reaction to a competitive threat: it was an instinctive English compromise to keep what was best of the old – the independent shopkeeper who catered for the wishes, occasionally even the idiosyncrasies, of his customers while keeping pace with the new.

By a curious irony the independent retailers adopted the methods of the Co-operative Societies (once their greatest rivals) to fend off the aggressive tactics of the superstores. In a sense both the Co-operative movement, founded at Rochdale, Lancashire, and the voluntary groups are striving for something beyond simple profit: satisfaction; one in personal relations with customers, the other in a vague kind of social service.

Garfield Weston, a bustling Canadian who invaded the British market with his Associated British Food flour concern and his Fine Fare supermarket chain recognized the strength of retailer resistance to the big battalions when the small grocers boycotted his products. So he asked to be allowed to address their annual conference. In a speech which lasted twice as long as scheduled, Weston pulled out all the emotional stops. He had been a 'small man' himself. He knew their problems—and their hopes. He wanted to help them.

The result was the establishment by Weston of cash-and-carry wholesale stores where independent grocers could buy products at the same prices as those charged to Weston's own shops. A small interest charge was added to cover overheads. So Garfield Weston had his way The boycott was lifted. Nor can it be said that the independent grocers had any cause for complaint. Just the reverse. Through this method - and comparable ones adopted by the voluntary chains—they have been able to keep down prices to the consumer and retain 50 per cent of the grocery trade. Weston appealed to and recognized as valid three strains in the British character: desire for independence; respect for the voluntary spirit; readiness for compromise.

Chapter 11

TRADER UNLIMITED

Outside the United States, Britain is far and away the greatest world investor. The total value of United Kingdom investments overseas[1] amounts to £20,000 million; the United States has about half as much again. A long way behind comes France, with about one-quarter of the British stake. Considering how British reserves were reduced in two wars, while America's assets increased enormously, that is no small achievement by the British.

The ferocious zest of British merchant adventurers found its ideal setting in the free-trade atmosphere of the late eighteenth and nineteenth centuries. Chiming with the inventions that transformed the cotton industry, revolutionized transport and brought the iron age into being, Britain swept aside French opposition in Canada, India and southern Africa. These areas as well as Australia, New Zealand, Latin America and the United States were opened wide to British capital Mining companies began digging up precious metals, frequently finding uses for ores previously disregarded British capital created the gold and diamond industries of South Africa, and in consequence uranium-mining, which is often a by-product of gold-mining. The chrome industry of Rhodesia, the fabulous minerals of Canada, the nickel of Australia—all owe their development to the questing urge of the British. Rio Tinto Zinc, the Consolidated Gold Fields, Lonrho—these are some of the big names to conjure with in ore exploration and exploitation.

Having an empire helped enormously of course in giving the country's nationals a head start over foreign rivals. But

1. About half the British total is in the form of direct investment, the remainder is portfolio (i.e. the holding does not involve management) and government investment.

even the liquidation of the Empire has not stopped Britain's development of mining potential the world over. Lonrho (London-Rhodesia) is a tremendous pace-setter in Africa, and the company in its expanded state is wholly a post-war creation. Rio Tinto Zinc, RTZ, under the determined leadership of Val Duncan, has grown from a fairly minor concern, principally involved in Africa, to a world-wide giant. Its areas of operation, by percentage of capital employed, are: Australia, 42%; North America, particularly the Rio Algom mines in Canada, 24%; U.K., largely aluminium, 15%; Southern Africa, 17%; Europe, 2%. In addition the company is undertaking big exploration and development work in Papua, New Guinea and Iran. Every source of mineral wealth comes within RTZ's area of operations.

Backing up the mining companies in arranging finance and providing organization and contacts is a remarkable web of expertise known as the Commodity Markets of the City of London. Of course they do not deal only with metals; far from it. The commercial sale rooms, known throughout the world as Mincing Lane, cover rubber, grain, cocoa, wool, coffee and sugar, copra, fur, diamonds, hides, skins, spices, shellac and tea.

Rubber grown in the Far East is re-shipped to the Soviet Union via London, and on the way British operators, by providing the mechanics of delivery and by establishing realistic commercial prices on the free market, earn shipping and insurance income. Thirty per cent of America's sherry is from Harvey of Bristol, although Britain produces not one litre of sherry. Indeed the capacity for utilizing flair in the service of distributing the fruits of the earth is seen at its most spectacular in the operations of the City.

In that 'square mile' is a concentration of sheer 'know-how' to dwarf the rest of the world. Within its bounds, besides the headquarters of the commodity markets, are the gold market, the shipping and air chartering market, the insurance market and more bank head offices than all the other capital cities put together. London, for example, is the centre of 4,000 bank branches—twenty times more than

New York. Three-quarters of the world's gold dealings are done at Rothschild's in New Court.

Yet all this expertise, all this magnificent interlocking of agencies which embrace and bring together suppliers and customers round the globe, was apparently damaged beyond repair by three decades of panic, slump, dictatorships and war. Mincing Lane itself was physically wiped out in the bombing of 1941. For ten years before that the delicate mechanism of the free market had been brutally debauched by the politics of the totalitarian States, and the frightened reaction of most of the Western world to the depression of 1929–33. The war seemed to signal the end for London. Even were Britain to survive, all power, it was felt, must be transferred across the Atlantic. J. G. Winant—United States Ambassador to Britain 1941–6 and a good friend of this country—told an audience late in the war that the United States was the natural home for most, if not all, the activities of economic man.

Post-war conditions appeared to bear out these American hopes and British fears. The British Labour Government was obliged to impose fierce exchange controls on the transfer of capital. The pound sterling was not convertible. Foreign travel was virtually banned. Slowly the controls were lifted. First wool and then other commodity markets were re-established. With the return of the Conservatives in 1951, the process speeded up considerably, starting with the freeing of the Liverpool Cotton Exchange.

At 10.30 on the morning of 22nd March 1954 representatives of six bullion houses met at Rothschild's after an interval of fifteen years. Their aim was to re-establish London as the bullion centre of the world. They faced a grim task The British economy was still in a convalescent state. East glowered at West. Sterling was still not freely convertible into dollars. Even Commonwealth gold production, or at least much of it, was being sold through other channels, notably Zürich. Yet within sixteen months the magic of the City had worked. By the close of 1955, 85 per cent of all fresh supplies of the yellow metal coming on the market was being handled

in London. Ten years later the Bank of England claimed with surpassing modesty: 'London is the largest and most important gold market in the world.'

How was it done? M. Julien-Pierre Koszul, Director-General of the Foreign Services of the Bank of France, explained:

> The British banks very quickly and efficiently won back the international gold market from the Swiss when the London gold market re-opened in 1954. The British acted straightforwardly and decisively. Whether buying or selling, they dealt in margins deliberately smaller than those of the Swiss banks and thus recaptured this market by direct competition.

Stability, keenness, integrity. These are the essentials. The motto of the Stock Exchange, 'My Word is My Bond', has been broken by the odd crook. But on the whole it is believed more of the City of London than of any other spot on earth. Added to those factors, the cheapness, efficiency and flexibility of the City were further factors encouraging the South Africans, the Russians and others to 'go through London'.

The chief of the research department of the American Federal Reserve Bank has admitted: 'After half a dozen post-war crises London remains the pricing centre of foreign trade financing. The continuing predominance of British banks is significantly reflected in the much more extensive network of foreign branches maintained by British banks compared with their American counterparts.'

Without question the wide spread of British financial institutions helped the re-establishment of British supremacy in the marketing business. London-based banks have some 4,500 representative offices abroad: 2,300 in Africa, 1,400 in Australia and New Zealand, 300 in the Middle and Far East and a small but growing number, about 30 plus, in the United States.

Since the war the unit trusts—the largest of which, Save and Prosper, was founded in 1937—have provided brisk

competition for the traditional repositories of the small man's savings: Building Societies, Post Office and National Savings, the Co-operatives. This spreading out of capitalism to embrace upward of 3 million investors has helped to identify the public more closely with the free-enterprise system. In itself it is not a new development (Selfridge's, the big London store, recorded a valet, a housekeeper and a gardener among their shareholders at the turn of the century), but the degree of involvement in stocks and shares is much greater than heretofore. In their own 'City', Charlotte Square, Edinburgh, the Scots have evolved a highly organized Scottish branch of the unit trust movement. Units are sold over bank counters, thereby serving the Northern Kingdom's righteous passion for making money work.

In widening the appeal of capitalism the merchant banks have been vitally important elements. Many of the country's most renowned and respected banking-houses were founded by refugees, men seeking asylum from religious and political persecution and later from the racial doctrines of the Nazis. About sixty City firms could carry the title 'Merchant Bank', a mere handful form the core of the institution: the Accepting Houses Committee. Membership of the committee is self-perpetuating. Three factors influence choice: size, diversification and business reputation. The committee has an agreed minimum rate of commission on acceptances, and access to the Governor of the Bank of England. History and national character have formed the merchant banks into what they are. They flourish because they recognize ability and allow the individual to extend himself to the full in search of profitable business.

The English clearing bank system—Scotland has its own—is controlled by four major groups: National Westminster, Barclays, Midland and Lloyds (no relation to Lloyd's of London, the insurance market). They in turn are associated with banking groups all over the world. And increasingly they are financing operations of an international character from a domestic base.

Unlike the German banks, which own or have a very large

stake in many of the companies which they provide with overdrafts, British banking concerns are but loosely concerned with business. A business man is simply another customer. To some degree Japan is in the same category as Germany, able through her interlocking financial/industrial ownership to provide firms engaged in export trade with highly preferential treatment. Britain's response has been to arm the Export Credit Guarantee Department, a government agency, with extra power and cash to supply attractive credit to potential overseas customers. The ECGD covers nearly 40 per cent of all British exports. But the arranging of trade is still very much a private-enterprise venture.

The Baltic Exchange, home of the shipping world, is a prime example of Britain's pre-eminence in commercial dealings. At the end of the bitter religious conflict, with its overtone of Parliament versus King, Britain in the 1690s was launched on a period of tremendous expansion. The Bank of England was founded (1694) and the means of a livelier credit policy was created. In the following century England – particularly during Walpole's long peace – followed her business instincts while France, her principal rival, pursued glory. Clive's victories in India and Wolfe's in Canada encompassed the downfall of French colonization in these lands and established Britain as the dominant European power in North America and Asia. The French Revolution smashed France as a formidable trade competitor, for no trader was going to trust a revolutionary regime with his money. So London was left supreme: hub of a world-wide trading empire; stable, enterprising, free – and offering 5 per cent on good ventures.

It was about this time that the Virginian and Baltic Coffee House was renamed the Baltic Tavern. For a century or two before, merchants had taken to meeting in the Virginian and Baltic – earlier it had been known as the Virginian and Maryland, after two of America's oldest colonies. They found the coffee-house an amiable place in which to do business and were attracted to London because in addition

to easy credit terms it was a convenient place to make shipping fixtures, i.e. an agreement on rates fixed between the owner of a ship and the owner of a cargo, usually arranged through a broker. Anyone who wanted to shift goods from one side of the world to the other sought a cargo-seeking shipowner at the Virginia Coffee House, later the Baltic Tavern.

The casual atmosphere of the tavern was fine, but as trade grew with the introduction of steam it was felt that stricter regulations were required for the conduct of affairs. W. M. Clarke in *The City in World Affairs* describes what happened next;

> By the turn of the twentieth century it was necessary to come to terms with a new shipping exchange opened specifically to cope with the new liner trade. The old Baltic and the new Shipping Exchange decided to join forces and by 1905 a joint building had been completed, where it still stands today, at St Mary Axe . . . of both shipowners and traders.
>
> Agents from all parts of the world meet here daily to come to terms about freight rates, times, journeys. With a total membership of 2,700 the Exchange can normally expect at least 1,000 attending at one or both of the daily meetings. The members appear in one of two guises: as shipbrokers trying to find suitable cargoes for vessels, or as charterers, agents wanting ships. The result is the fixing of cargoes for tramp ships from one side of the globe to the other.

Whether it is grain to be moved from the Pacific or the River Plate or coal from the east coast of the United States, the Baltic Mercantile and Shipping Exchange (to give it its full title) is where the cargoes and shipping space are married together. This is not the only business conducted there. Ships that need to be built, sold or scrapped are also traded or negotiated in the Baltic. Several firms specialize in the sale and purchase of ships, supported by many other brokers

who run departments devoted to this type of commerce. Like the freight market this is world-wide business. The result is that, as the Exchange itself claims, more than 50 per cent of the world sale and purchase of ships and cargoes passes through firms represented by the Baltic.

Here, as in the gold-market, or in Mincing Lane, Communist and capitalist rub shoulders. When Mr Khrushchev's virgin land policy turned sour and Siberia failed to provide the grain for Russia's needs the Soviets turned to the Baltic for aid. Chartering of grain-ships from Australia and Canada to Russian ports was fixed there. Again, after the Cultural Revolution had wreaked its havoc on China, Peking turned to London for succour. Food shipments—once more from Commonwealth countries -were arranged to meet China's emergency. The money to pay for them was found by China selling metals on the London metal exchange.

Although methods of communication have been revolutionised in this century, and virtually all business concerning ocean-going tankers, dry-cargo arrangements and even long-term charters are fixed by telephone or Telex, the standards are still expected to comply with the 'word-is-my-bond' handshake of the Baltic Exchange. This sets the pattern for deals throughout the globe. In a Siamese hotel or a Buenos Aires bar the principle is the same: 'If it's Baltic-stamped it's OK.'

Working with the Baltic are the powerful commodity traders like the one hundred-year-old firm of Price and Pierce, comfortably mature, if not in the same class as Lloyd's. They are timber merchants. That is, they handle business worth close to £150 million a year without necessarily touching a sliver of wood. They place, for example, a large part of Finland's pulp in many markets round the globe; making contact with importers who agree to take such-and-such an amount, seeing that the supplier is paid as soon as the cargo is shipped and that the importer is financed while he goes through his sale. Shrewd dealings and a highly competitive commission yield a thoroughly

satisfactory profit and contribute no little to Britain's earnings of foreign currency. The City's financial institutions contribute some £1,000 millions to the balance of payments, almost four times the amount earned in 1967.

Chapter 12

LONDON OR NOTHING: INSURANCE

'We ought not to let daylight in on the magic.' Thus Walter Bagehot, the distinguished nineteenth-century economist on the mysteries of the City and the world of insurance. By an amusing irony one of the few items Lloyd's in its near 300-year history has refused to insure was the Magic Circle's theatre in 1969. The Circle asked for a quotation against the theatre 'disappearing' during a week's special performance. Lloyd's said 'No'. Not from fear of the risk but because it was considered too much of a 'gimmick' for the world's mightiest insurance club to accept a 'fun-type' policy. Which is passing strange. For in earlier days Lloyd's, founded in 1688 like so many British institutions, in a coffee-house—had a reputation for flippancy and gambling.

The principle of underwriting, of spreading the risk of insurance, was soundly established in Greek and Roman times. For example, Cato recommends a capitalist: 'Do not fit out a single ship with your own money but enter into a partnership with 49 other capitalists so as to send out 50 ships and take an interest in each to the extent of a fiftieth share.' The partnership system took the place of insurances, which were unknown to antiquity. With the opening up of the world by the merchant adventurers in the sixteenth century more certain and enduring methods were required to offset the hazards of marine loss, and so insurance more or less as we know it today was born. And early on, Portuguese traders were observing: 'Foreigners from all parts of Europe have recourse to London . . . at Cadiz the premiums are frequently double those charged in England.'

Edward Lloyd's Coffee-House in Tower Street was simply one of scores of places where this kind of business and many other types too were transacted. Because it was near the

Thames it attracted seafaring men and merchants willing to insure cargoes. The individual insurers—there were no companies then—wrote their names beneath the wording of insurance policies, hence 'underwriters'. Lloyd encouraged this practice by supplying paper and pens and ink and published shipping information obtained from wharfside runners in a sheet known as *Lloyd's News*. It was the forerunner of *Lloyd's List and Shipping Gazette*, London's oldest daily newspaper, still flourishing.

However, the gambling Scots got Lloyd's original coffee-house a bad name, and the society of underwriters who had formed themselves into an association, subscribing twelve guineas per annum for a register of shipping which they were required never to show to non-members, decided to quit the premises and asked a waiter, Thomas Fielding, to establish a new house with a less unsavoury reputation. It became known as New Lloyd's Coffee-House in Pope's Head Alley. After a committee had been elected to administer the enterprise in a businesslike fashion and each of Lloyd's seventy-nine members had paid £100 into the Bank of England to buy really grand premises, Lloyd's moved to rooms in the Royal Exchange in 1774. John Julius Angerstein emerged as the dominant figure in 1779. He is acknowledged as the Father of Lloyd's; another example of the significant role played by continental and other families in the development of British financing. In 1871 Lloyd's was incorporated by an Act of Parliament. The club atmosphere, however, was deliberately perpetuated.

If any institution may be classed as an example of the British genius, for marrying casualness with intense professionalism, for combining hallowed traditions with extraordinary speed of operations, it is Lloyd's.

First the casualness. The underwriting room in the magnificent new premises at Lime Street, opened by Queen Elizabeth the Queen Mother in 1957, is 120 feet wide and 340 feet long. It is just a market place from which spectators look down on the hubbub below. Brokers sidle up to underwriters, chat to them, ask them to sign a piece of paper and move off

again. A deal, perhaps of £1,000, perhaps for £10 million, is in the making.

What has happened is that the broker (there are 240 approved Lloyd's broking firms) has been instructed by a client to get the best terms for insuring a particular commodity. Although the broker must be approved by Lloyd's Committee before he is permitted to operate there he is not restricted to Lloyd's. He may test out the market and place the business with any insurance company.

When a broker receives a request he makes out a 'slip', a folded sheet of paper on which are written the details of the risk to be covered. He then tours the underwriters whom he knows to be specialist in the particular category for which the insurance is intended: marine, motor and aviation (ground floor); general, from jewellery to power stations on the gallery floor. Having obtained the best quotation, he merely asks the underwriter to accept the risk by scrawling his initials (called 'writing a line'). With these initials as a lead the broker approaches other underwriters persuading them to accept proportions of the risk in the same way and at the same rate until he has sufficent to cover the full value. Each underwriter is responsible only for his portion of the total sum insured. Underwriters will always honour their initials even though a claim may arise before a full policy document has been prepared. 'Look! No contract!' gasped one excited transatlantic viewer of this little scene.

Now, as to the underwriters: to be elected to Lloyd's—which, remember, resembles a club in many ways still—the applicant must 'show' wealth to the tune of about £100,000 and furnish security in an approved form to a minimum of £15,000. The candidate, a man of any nationality (this since 1969), or a British woman domiciled in the United Kingdom, must be nominated by one and supported by five other members. He or she accepts that personal liability is unlimited, must satisfy the committee of sixteen of financial and business probity, and pay all premiums, including a special initial one, into one premium trust-fund approved by the Board of Trade, from which alone claims, expenses and

ascertained profits may be paid. The level of this contribution must be kept up before profits are distributed. The underwriter must furnish a guarantee policy each year based on the premium income and contribute by means of a levy to a central fund designed to meet the liabilities of a member who defaults through his assets being insufficient to comply with his liabilities. The fund is for the benefit and protection of the assured; not for the underwriters, who are liable for every penny of their personal fortunes.

Clearly only wealthy men become underwriters. It is a bit of a gamble, a social achievement and a considerable honour —all elements calculated to appeal to a Briton. Every kind of person is represented, from landowners to successful actors, and champion boxers, from top medical practitioners to tycoons of industry. There are over 6,000 underwriters grouped into 271 syndicates (131 marine, 72 non-marine, 30 aviation, 31 motor and 7 short-term life, long-term life not being acceptable). The syndicates range from a half-dozen members to upwards of 700. Professional experts, underwriting agents, undertake the transactions on behalf of the names of their syndicate. The business is audited every year, but the share-out to members refers to business done three years previously. Twenty million items are accounted for each twelve months and three computers now deal with the volume of traffic. But although computers and centralized accounting, through Lloyd's Policy Signing Office, are in operation bureaucracy has not taken over. Red tape is not a menace. Thus Lloyd's share of the insurance cost of the sunken Italian liner *Andrea Doria* was paid out in *five days*.

It is this astounding swiftness which so impresses foreigners. The Americans became fans of Lloyd's when the underwriters' agents set up a table in the ruins of San Francisco to pay out to insured victims of fire and earthquake. British insurance had already won United States hearts forty years previously when the great Chicago fire destroyed that city. 'What,' asked a Canadian contemporary journal, 'would have become of the sufferers if they had had to depend on the ten Chicago and four Illinois companies that were on

the risk?' Without the British there would have been financial disaster on a scale to match the material holocaust.

So fascinated are the Americans with Lloyd's and British insurance that they not only insure with them (about one-third of United States marine business is settled with British concerns and 10 per cent of all United States insurance), but they actually made a film, *Lloyd's of London*, starring Tyrone Power. Of course it was not the mechanics of the place but its fabulous history which attracted the film-makers. The desks at which the underwriters' agents sit are costly replicas of those used in the old coffee-house. Entries of casualties are made in a big book with a quill pen, and on a particularly stormy day there may be as many as one hundred entries.

At the heart of Lloyd's stands the Lutine Bell, synonymous in many people's minds with the corporation itself. The bell belonged to the French warship *Lutine*, which surrendered to the British off Toulon in 1793. She was transferred to His Majesty's Navy and sank in a great storm off Terschelling, with the loss of all hands and £1,400,000 in gold bullion. Some of the ship's furnishings plus £100,000 have been recovered by salvage. Among the items rescued in 1839 was the Lutine Bell. It hangs above the caller's rostrum in the underwriting room and is rung not for every loss at sea as is popularly supposed but for important announcements: one stroke for bad news, two for good. Like the 'caller', who follows the waiter's role of the coffee-house days in calling brokers to come and receive important information, the Lutine Bell is a useful link between past and present. It is also a symbol.

During the war the German propagandist William Joyce, 'Lord Haw-Haw', would ring an imitation Lutine Bell to announce allied ships sunk by U-boats. This was part of the Nazis' psychological warfare. Indeed anything to do with the City of London obsessed the Nazis. They regarded the City as the core of Western capitalism and Goebbels alluded to it as one of Germany's most obdurate foes. Just as Napoleon viewed London as the paymaster of his enemies, so Hitler

believed, with less justification, that it was subsidizing *his* enemies. In truth Britain had emptied her treasury and by the middle of the war was herself in receipt of subsidies from the United States.

In refilling the treasury Lloyd's and the whole British insurance industry have played a notable part. The risks have matched the rewards, and the range of activities insured or reinsured by the London market is a testimony to the City's central position in world finances. Take some examples:

The temples of Abu-Simbel on the Nile during resiting were covered at Lloyd's for a total of £37 million; almost all of San Francisco Bay's Rapid Transit system was met for a liability of £100 million including construction and third party; most of the insurance on the Delaware Memorial Bridge was covered by Lloyd's, and when the San Francisco East Bay Municipal Utility District found difficulty in getting long-term insurance against earthquakes, Lloyd's stepped in; ships of the Norwegian Navy; the *France* liner; the *QE2*; the Concorde; international exhibitions, such as Expo '67 in Canada; Shell's refinery at Rotterdam—all are among the latest in the roll call of Lloyd's. America's race riots and hurricanes savaged the London insurance market, as did the Great Train Robbery, which cost Lloyd's £1 million, and the new giant oil tankers, a number of which suffered explosions or were sunk or damaged in collisions.

Not all ventures, of course, are on such a mammoth scale. No contingency is too small for Lloyd's. An RAF band was engaged to play at a World Cup football match and the promoters were covered for £750 against the risk of its not turning up; the band arrived. You can also be insured against the incidental liquor costs of holing in one at golf.

One of the oddest claims to have been met at Lloyd's was from a South American woman motorist. She put out her hand to indicate a left turn—only to have the jewels snatched from her fingers by a little boy who got clean away in the crowd.

Mr T. W. Milligan, a recent chairman of Lloyd's, descri-

bed the essential character of the institution in these words:

> Lloyd's underwriters are often in the headlines for their willingness to 'have a go' at the unusual risks, whether the cover be against holing in one, being hit by a straying satellite or the drowning of a mechanical whale. This type of risk is, of course, very much a sideline to the main volume of business but it is indicative of the individuality of the market and it provides the reason why a great many risks of a much more important nature—burglary insurance and loss of profits from fire to name but two—have been pioneered at Lloyd's before becoming general practice elsewhere.

The extent of this pioneering process may be gauged by the fact that British insurance companies are estimated to pay out well over £1,000 *a minute* in claims for fire, accident and marine hazard all over the world. The potential liability is swiftly rising as the jumbo-jets come into service and the way is made ready for supersonic travel. Even on sea insurance cover for the *France* and the *QE2* is eight times what it was for the old *Queen Mary*.

There is no detailed Government supervision at Lloyds. It is stable—but also flexible enough to develop new forms of insurance to meet new needs. Among new forms of risk to be covered are atomic power stations, which are costed for insurance purposes at £50 million and more. The world waited for Britain to estimate the value of her own Calder Hall type reactor and then took the British price as 'standard'.

So secure has British insurance become as world leader that in its economic measurement of the cost of the United Kingdom's joining the European Economic Community the Treasury economists were almost lyrical about the prosperity for British insurance in an enlarged Common Market. As they said in paragraph 91 of 'Britain and the European Communities, an Economic Assessment':

> There should be a valuable expansion of our invisible

earnings as a result of membership. In the field of insurance, for example, the EEC countries have legislation which in one way or another discriminates against non-EEC insurers—in contrast to the United Kingdom where there is no such discrimination. Membership should, therefore, provide British insurers with better access to other EEC countries than they have at present.

This is despite the fact that London-based insurance is impeded to some extent on the Continent by State restrictions governing reserves and deposits (a considerable percentage must be in official stock).

As Harold E. Raynes says in his standard work on the subject *A History of British Insurance*:

> The growth of overseas business by British companies has been subject to uneven progress and has been made often in the teeth of determined opposition from local institutions, national prejudice and adverse legislation. The companies have won their way by sheer merit in the conduct of their business, persistent enterprise and the superior financial security they have offered to their policy-holders over local institutions . . . British companies were able to sell this first-class indemnity in America and elsewhere and the very catastrophes which destroyed many of their competitors served only to establish the reputation of the British concerns more securely.

The British made it their business to judge the risks exactly, to pay out promptly, and to bring premiums swiftly into line with changed conditions.

Reinsurance—foreign companies laying off risks with London—became widespread after Storebrand, a Norwegian company, placed a treaty with the Phoenix Assurance Company in 1862. Neither native companies in Norway nor any continental concerns could provide what London did. As with the Continent so with Latin America. When the Sun Insurance moved into Chile in 1885 it found nineteen English agencies already established in Valparaiso alone.

The mighty life offices, the Prudential, the Pearl, Legal and General, are naturally primarily concerned with the home market, but they are also strong abroad. In the remarkable 'pink château', the Prudential's headquarters in Holborn, a distinctly international flavour pervades the atmosphere, where half a dozen foreign tongues may be heard inquiring about policies, although some of the more daunting problems are raised nearer home.

A letter one is shown in the Prudential museum illustrates the extraordinary claims clients sometimes make. The letter is from a policy-holder in the West country, and dated 1909. He asks in a most polite manner if the company will honour its obligations in respect of death benefit in the event of the policy-holder being translated to heaven without dying—an event which, it appeared, he was reliably informed would befall him as one of 'the elect'.

As Mr R. A. Handover in a paper delivered to the Institute of Insurance observed: 'London really is unique—because of the width of its trading connections; because the London broker offers a fund of knowledge to insurers requiring quotations that probably has no equal, because the largest risks can be accommodated; because the compact nature of the market ensures speed and efficiency.'

Even where countries have nationalized their insurance—a common proceeding in developing countries the State boards still turn towards London for reinsurance—or perhaps it would be better to term it *reassurance*. For example, Chile, Argentina, Brazil, Turkey channel their reinsurance through London. So does India. So do the African and Asian ex-imperial lands, who find it a great comfort to have British representatives on the spot to provide advice for the local insurance organizations. Nationalized oil concerns in the Middle East which have given their insurance to State systems have been obliged to reinsure through London in order to ensure solvency. The net contribution of British insurance to our balance of payments comes to about half of the City of London's invisible earnings. In normal years

these 'invisibles' exceed Britain's traditional deficit on visible trade.

That is a cause for pride which is insufficiently recorded. And it is a tribute to the genius of the 'quiet' industries which have made it possible.

Chapter 13

MANUFACTURER INTERNATIONAL

Britain owns 16 of the 100 largest firms in the world (and 49 of the 200 biggest concerns outside America—the largest figure of any nation) for two reasons. Since the days of Francis Drake Britain has 'thought globally' and this century the pressure of United States rivalry has forced defensive combinations. Imperial Tobacco, commanding two-thirds of the United Kingdom tobacco industry, was formed in the 1920s to prevent the American take-over of the then fragmented United Kingdom tobacco trade. Now, through its association with British American Tobacco, it controls the third biggest United States tobacco firm, Brown and Williamson, and has branched into cosmetics and the convenience-food market both in Europe and the States.

Imperial Chemical Industries is another mighty grouping designed to operate internationally in competition with American firms. So is General Electric. At one time, in the twenties, part of this concern, Associated Electrical Industries, was owned by the Americans, as were a number of electricity supply utilities. They were brought back into British hands when the great slump of 1929–33 forced American industry to contract. Today the boss of General Electric, Arnold Weinstock, keeps a pad on his desk with the names of the American firms which are larger than his own, a constant reminder of the target at which big business in Britain must aim.

Bigness is neither a virtue in itself nor is it essential for success. But in a world of giants it would be folly to ignore the rewards of size. G. Keith Funston, when president of the New York Stock Exchange, reckoned that 'the growth of the multi-national company in recent years has been one of the greatest things in business . . . of the 200 largest com-

panies in the U.S. an estimated 84 per cent now has one or more foreign subsidiaries'.

How stands Britain in the 'big-time league'? To appreciate Britain's position and the likely development of her international companies let us examine two companies which provide evidence of that uniquely fruitful partnership between the British and the Dutch: Shell and Unilever.

It is part of the British genius to be heavily involved in affairs wholly outside the scope and resources of a small island group in the North Sea. No example better illustrates this than the story of how Japan gets its natural gas. Liquefied natural gas is being delivered to the Tokyo Gas, Tokyo Electric and Osaka Gas companies to a total of 65 million tons, and for a period of twenty years starting in 1972. The LNG (liquid natural gas) is produced by Shell from off the shores of Borneo and transported to Japan in special tankers (some built in the United Kingdom) from a specially constructed jetty three miles long. Thus a British or, more accurately, an Anglo-Dutch enterprise serves the swiftest growing economy in the world with a vital means of continued expansion from resources the other side of the globe.

'Here we were with all this gas in Brunei and it was up to us to find a market for it,' explained project team leader John Jenkins. 'In Japan, they need more and more energy, especially sulphur-free fuel. What we had to prove was that we could produce and liquefy our natural gas, transport it 2,400 miles by ship and still sell it at a competitive price. Moreover we had to show that we could do it regularly as clockwork for twenty years.'

How many ships would be needed, of what size? Should they have self-supporting tanks (like the Canvey Island methane carriers) or adopt the newer 'membrane' type of design? What would their running costs be? How would they handle in freak weather conditions? The answers were gradually accumulated with the help of the draughtsmen, economists, engineers and mariners. A 15-foot-long radio-controlled LNG carrier was built and tested exhaustively at

the government-run marine research laboratory at Wageningen in the Netherlands.

Researchers tested the effect of different combinations of winds, waves and currents to work out the best way of manœuvring the ship into the Brunei berth, how the mooring-lines should run, what stresses were exerted and what would happen if a mooring line broke. The problems were solved and the deal was clinched.

As David Barran, chairman of Shell, justly claimed: 'This is not just a big business deal, it is an indication of the company's belief in the future of LNG and of its part—along with other elements of British industry—in creating a new industry.' Unlike so many missed opportunities for developing British inventions, LNG is a case of the United Kingdom exploiting the business potentialities of something first thought out by the Americans.

The process of liquefying natural gas—which forms about one-third of the world's hydro-carbon reserves—was developed in the States as long ago as 1917. But commercial progress was slow because of the difficulty in moving the liquid gas economically by sea from the sources of supply to the energy-consuming markets. In 1951 William Price, the president of the Union Stockyard Company of Chicago, conceived the idea of moving liquid methane (methane refrigerated to minus 161° C. and consequently occupying one-600th of its gaseous volume) by barge up the Mississippi from the company's Louisiana gas plant to its stockyard in Chicago.

The pioneering work was brought to the notice of the United Kingdom Gas Council, a State-owned agency which, at the time, represented an apparently dying industry. 'The Gas Age' was a term applied to things considered hopelessly out of date. The Gas Council which had, and has, some very lively minds on it, took an altogether different view. They smelled success. The council entered into partnership with Union Stockyard and Continental Oil for the conversion of a cargo vessel into an ocean-going liquid methane carrier to transform LNG transport from the barge

to giant tankers. In February 1959 the world's first LNG carrier, the *Methane Pioneer*, docked at the Gas Council's terminal on Canvey Island, Essex, from Lake Charles, Louisiana. The New Gas Age had begun.

Shell International joined the consortium. A company, Conch Methane Services Ltd, was formed with headquarters in London, and following experience with the *Methane Pioneer* the world's first LNG tankers were built: the *Methane Princess* at Vickers of Barrow, the *Methane Progress* at Harland and Wolff, Belfast. Each of these advanced ships was 12,000 tons, but they had the carrying capacity of conventional tankers double their size.

The Gas Council's scheme was to import LNG from Algeria, which had just discovered huge deposits of natural gas in the Sahara. Another consortium, this time including the French, was created to erect a liquefying plant near Oran on the Algerian Mediterranean coast. The gas was piped there from the Sahara, tankers loaded and dispatched to the market. This European enterprise, in which Shell and the Gas Council played the leading parts, resulted in America's importing LNG. The Boston Gas Company bought the first consignment, which was carried in the *Methane Pioneer*.

The Gas Council advanced a scheme for Nigeria similar to that in Algeria, but the exciting discovery of huge deposits of natural gas in the British zone of the North Sea diverted all attention to the wealth on Britain's doorstep. Instead Shell went searching for markets which were still desperately short of energy. That is how the Shell–Japanese deal of September 1969 came about. Others will surely follow, especially in the United States, as there is an increasing shortage of natural gas resources in that nation.

The whole saga of Royal Dutch Shell, to give the company its full title, sums up the challenge of world economic power and the British capacity to meet it in partnership with a people of very similar outlook.

Britain and Holland share many attitudes and aptitudes. They once shared the same monarch, William III. They are

temperamentally opposed to tyranny or arbitrary government in any form. They are stubborn, practical, slow to anger, but their anger once roused is typically of the patient man pretty ferocious. (The Dutch have gone the least way towards forgiving the Germans their war-time atrocities.) The two peoples are law-abiding, sea-faring, geographically small and relatively overcrowded. Both had empires founded on trade and both are pragmatists. They are natural allies.

The origins of their partnership in oil illustrates, in company terms, the pressures which are pushing Western Europe towards close enonomic union. It is not actions towards a theoretical end which matter but reactions towards an external threat. That is the true motivating force of most historical events. So it was with Shell.

The original Shell was a small store in the East End of pre-Victorian London which dealt in antiques, curios and bric-à-brac, including oriental shells, then growing in popularity as households accumulated possessions. The owner of the shop was Marcus Samuel. Forty-five years after it was founded his son, also Marcus, took over. It was 1878. Twenty years previously oil had first been discovered in Pennsylvania. Six years previously Russia had discovered oil in Baku. East and West, the industrial giants of the twentieth century were already beginning to enjoy the first fruits of inherited wealth.

Samuel was impressed with the cases of kerosene that came his way from Russia as part of the general dealings in which he was now involved. He decided to see for himself how the oil was produced. He visited the Black Sea. He saw tankers being operated from the port of Batum, which the Russians had built to transport their oil from Baku to the rest of the world.

At the time Standard Oil of the United States dominated the European market. American exports to Europe rose from 2 million gallons in 1863 to 700 million in 1890. In the East, however, Standard was challenged by the Russians, and the Russians were not among the world's greatest business men. Here was an opportunity to act as salesman for

Russian oil in Asiatic markets. Marcus Samuel took it. He ordered eight tankers, set up bulk oil-storage depots in the Far East, made a contract with a Russian producing group (owned by Rothschild's—who are still involved with Shell) and started operations in 1892, selling kerosene for the lamps of China, and anywhere else that would buy it. At about the same moment, Royal Dutch Petroleum started developing an oilfield in Sumatra, then part of the Netherlands East Indies (today Indonesia). To compete with the Russians and Samuel and Standard Oil the Dutch built their own tankers, established storage installations and launched a sales force.

Samuel obtained an option to drill in Borneo and set up a refinery at Balikpapan not too far away from Royal Dutch. He now called his business 'Shell' after the shells his father used to sell and which were the foundation of the family's growing fortune. A reproduction of the fan-shaped shell became the company's emblem.

For a time it looked as if there might be an emblem without a company. Gasoline for cars was the growing market and Shell's oil in Borneo was low in gas content. Samuel turned to Texas, where fuel oil was first found in 1901. He also succeeded in making a contract for modest gasoline supplies from another East India producer.

This gave Samuel a wide spectrum of oil interests kerosene, oil, gasoline but both he and Royal Dutch were feeling the strain of competing with Standard. They had extended their operations from opposite origins: the Dutch starting with the discovery of oil and branching into trading; the British starting off as a trading concern picking up kerosene as one of the products and then going into full-time production. As their businesses converged so did their interests. Henri Deterding was now in charge of Royal Dutch and he was agreeable to a working arrangement with Samuel (and Rothschild). In consequence the Asiatic Petroleum company was formed in 1905 to combine the resources and sales of the two concerns in the Far East. Four years later the two companies merged. Royal Dutch was strong in gasoline, the 'growth' sector at that period, while Shell's

power lay principally in fuel oil which would not enjoy spectacular expansion for another ten years, so Royal Dutch initially emerged as the more influential partner, taking a 60 per cent stake in two new companies, one in London, the other in The Hague. Mr Samuel, who had now become Sir Marcus, rejoiced at the merger: 'The united companies being their own producers and producing oil as cheaply as it can be produced in any part of the world . . . have an indisputable command of the areas in which they trade . . . I cannot imagine any business built upon a surer foundation.'

However, the areas of 'indisputable command' were still mainly Asian. Then in 1914 Royal Dutch Shell struck oil in Venezuela. This proved to be the big strike and about the same time Shell invaded the United States, the home of gasoline. It was like carrying coals to Newcastle. Yet the business so prospered, aided by finds in the States, that by 1960 Shell was the second largest oil company in America, Standard having been broken up into several constituent, competing parts as required by the United States anti-trust laws.

The motor-car was coming into its own in the first days of the twentieth century. In 1919 Alcock and Brown, the British pilots, first flew the Atlantic in a Shell-fuelled converted Vickers Vimy bomber. Aviation fuel had arrived. Steamers were now using Shell fuel widely too. Shell spread its interests, and by 1922 was meeting about 6 per cent of world fuel consumption. By 1938 it was up to 10 per cent and marketing arrangements had tied it in closely with British Petroleum (viz. Shell and BP filling stations). Shell was a growing power too in chemicals and became a pioneer in the manufacture of nitrogenous fertilizer from natural gas and synthetic solvent from refined gases.

In the Second World War the United States got a second wind. The Dutch East Indies and Burma were lost to the Japanese. Holland itself was overrun by the Germans. The Mediterranean was closed to shipping, so that oil from Persia and Iraq had to go round the Cape of Good Hope. The only sure supply was in America, and the United States

oil companies responded with a will to the challenge and opportunity. In so far as Shell was well represented in the western hemisphere -in Venezuela, Texas, California—the firm enjoyed its share of the boom, but in scope it did not compare with the American domestic companies.

In the post-war years nationalism occasionally tinged with Communism flared. The Middle East was infected. So for a time were Persia and Indonesia, which threw out the British and Dutch. So new sources of oil were tapped: Nigeria, Tunisia, Algeria, Trinidad and off the coast of Holland, where nature, by providing a vast field of oil and natural gas, compensated for the buffetings of fate. Finally Britain received her share when Shell in company with Esso discovered the Brent field in that portion of the North Sea allotted to the United Kingdom, which will start producing in 1976 and should eventually contribute over 20 million tons a year, or over one fifth of Britain's 1974 oil consumption.

By 1970 off-shore exploration and the marketing of liquefied natural gas had become major factors in the international oil business. In both, Shell was ahead of foreign rivals. Group companies now supply 15 per cent of the world's total oil needs. In terms of turnover it has third place of all companies in the world. It operates in practically every State and produces oil in the following: Venezuela (largest single area), Brunei, Iraq, Persia, Colombia, Trinidad, the Netherlands, Germany, Austria, France, Turkey, Canada, the U.S.A., Argentina, Libya, Abu Dhabi, Nigeria, Gabon, Australia, Oman, Denmark, Spain, Kuwait, Surinam, Pakistan, New Zealand, Guyana. The group owns or has interests in eighty refineries all round the globe. It operates the largest tanker fleet in the world, one-sixth of the world tanker tonnage. In addition Shell is the eleventh largest chemical manufacturer.

Controlling this mammoth operation is a body known as the Managing Directors. In varying guises they boss both Shell Petroleum and Shell Petroleum NV—the Dutch part. They are also directors of the service companies and are appointed by the companies to a joint committee known as

the Committee of Managing Directors, which considers, develops and decides upon overall objectives and long-term plans to be put before the operating bodies. Marrying two companies with distinct national personalities is far from easy. Today there is a lot less jealousy and in-fighting than there used to be, Shell has now been a joint company for more than half a century.

Campbell Fraser, who helped initiate and negotiate the Dunlop-Pirelli tie-up, remarked that compared with the tax, legal and political complexities of that deal, combining Royal Dutch and Shell was primary school stuff. That union did, however, light the way, and its continuing success seems assured not only by the vast growth potential of the product it produces but by the style of management it is evolving.

In the great South Bank building with tower block which overlooks the Thames and dominates the Festival Hall, Shell's 4,600 employees (the Hague offices are not nearly so large or so grand) work in impressive surroundings. Each employee is backed by £36,000 worth of capital and it shows. There are a swimming-pool, a rifle range, a cinema and squash courts. Not that Shell does not deserve its high standards. Employees in the field endure harsh conditions and often encounter real danger, as in Nigeria during the civil war. The television programme 'The Troubleshooters', though it occasionally exaggerated and naturally telescoped incidents, was a true picture of the demands made by the oil business. The expatriates are entitled to enjoy a home spell in comfort, considering they get back to the United Kingdom only twice a year and that spells of duty may well last a number of years.

Each twelvemonth Shell receives about 350 graduates. From their ranks—be they chemists, physicists, mathematicians, linguists—will come the leadership of tomorrow of a concern which today commands sales of £7,775 million (equal to the national income of most of the countries in Africa); employs 175,000 workers in 500 companies scattered all over the globe and the sea as well (on any one day there are over 400 Shell-chartered ships on the oceans); con-

trols 41,000 miles of pipeline; and annually lodges a great deal of foreign exchange in London in addition to keeping most of its reserves—to the tune of £700 million—in British banks.

Shell has come a long way from the firm selling Russian kerosene to Chinese traders. Along with British Petroleum and Burmah Oil it keeps the United Kingdom in the very forefront of the world's most swiftly progressing industries, which embrace products of all types: chemicals, fertilizers, plastics, rubber, detergents, resins. Of the famed 'Seven Sisters'—the biggest oil companies of all—two are British, which is not bad for a country which has not got a single domestic oilfield to its name.

But more important than Shell's mere growth into a giant with a capital of £5,000 million are its qualities of endurance. It has emerged from two wars, which broke almost everything else, more purposeful and powerful than ever. It has been nationalized—and denationalized in Indonesia. Its companies in Russia and Rumania have been expropriated. The Chinese market has disappeared. West Africa has been struck by coups and civil war. Yet still Shell has held on. In a way the advertising jingle 'Go well. Go Shell!' is more than a mere slogan. It answers to the character of a company which reflects the character of the nations who supply most of its personnel: the British and the Dutch. 'International Companies' do in the end reflect the personalities of the nations which control them. So it is with Shell.

What of the other Anglo-Dutch giant, Unilever?

It would be possible for the British housewife—and housewives on the Continent and in the Americas also—to go through the day touching little else but Unilever products. They wash with Lux (or Lifebuoy, or Knight's Castile or Pears), brush their teeth with Gibbs SR (or Pepsodent or Signal), dress their hair with Sunsilk (or Harmony, Melody or Seawitch), apply Astral face cream, put Blue Band margarine (or Stork or Summer County) on their toast and eat Walls sausages for breakfast. They wash up the dishes with Sqezy (or Quix), clean the bath with Handy Andy (or Vim)

and the clothes with Persil (or Rinso or Surf or Omo)—a name that could be pronounced without trouble or double meaning in every known language. They go to the Mac-Fisheries Supermarket for Bird's Eye fish fingers. Surprise peas, a can of Batchelor's soup, a block of Walls ice-cream.

While the housewife is making her purchases the farmer is buying his animal feeding-stuffs from Silcock, receiving advice and supplies from British Oil and Cake Mills or watching work on a demonstration farm at Lever Feeds. The baker is purchasing fat and mixes from British Creameries, the confectioner his sugar confectionery produce from Loders. The catering trade takes in dripping from John Knight of London, tallow comes from J. L. Thomas of Exeter, packaging cases go from Thames Board Mills, Austin Packaging and Mitchams Cardboards to every kind of manufacturer.

Butcher, baker, candlestick-maker—all are customers of Unilever Ltd. Unilever supply a wider variety of goods in more countries to a greater number of people than any other concern in the world.

The factor common to the manufacturing part of the organization is that all the products are based on fats or edible oils. This indeed was the reason why Unilever was formed in the first place. Like Royal Dutch-Shell it was the outcome of a realization by British and Dutch competitors that they would do better as partners than as rivals in markets which purchased the products derived from a common source of raw materials. The darkening international economic scene—the time was 1929—also contributed to the desire to unite rather than divide.

The two elements of Unilever are the Margarine Union of the Netherlands (itself a merger of the Dutch concerns Jurgens and Van den Bergh) and Lever Bros. of the United Kingdom, with head offices in London and Rotterdam.

Lever Bros. started in soap. Two Bolton boys, William Hesketh and James d'Arcy Lever, began making and selling soap in 1885. What marked them out from hundreds of others engaged in the same occupation was the fact that they both 'traded up' to the new class of industrious artisans who

were beginning to taste middle-class habits. The Levers—the real organizational brain was William—sold their soap in neat tablets instead of long bars. They wrapped it in grease-proof paper rather than newspaper, and packed it in an attractive carton with an attractive name: Sunlight. 'There is no soap a man can sell that will do his trade so much credit as our soap', boasted William in an advertising slogan that made pithy good sense.

Lever began outselling every other kind of soap. Their jingles caught on and were adapted to the political situation—a sure sign of success. Thus children chanted at the opening of the Boer War:

> Poor old Kruger's dead
> He's lying on his bed,
> He cut his throat with Sunlight Soap
> Poor old Kruger's dead.

Paul Kruger, dour and unrelenting, President of the Transvaal, would hardly have appreciated this flippancy. Neither did Lever's rivals, for while the rhyme might be considered uncomplimentary to Sunlight Soap it repeated the name and spread its fame everywhere.

William Lever typified the Victorian tycoon-philanthropist. His workers were well looked after in the true paternalistic fashion, and his ideas on housing, for instance, were far ahead of his time. With his colleagues at board level a sterner attitude obtained. Each of his directors was obliged to write and sign a letter of resignation. These, locked in Lever's office, awaited but the addition of the date to be effective. It was one way of keeping the company leadership up to scratch.

In his years of building and consolidating his soap empire Lever clashed with many big personalities, none bigger than the Titan of the newspaper world, Lord Northcliffe, of whom it could have been said and probably was: 'There but for the grace of Napoleon goes Napoleon.' Lever won handsome damages from Northcliffe's paper, the *Daily Mail*, which ran a tempestuous campaign against Lever's alleged soap mono-

poly and its exploitation of the poor, unprotected customer. It is a measure of the time—the turn of the century—that such fantastically forceful personalities as Northcliffe, Lever and Rhodes (the founder of Rhodesia) should all have advanced to pre-eminence in business from the humblest backgrounds long before they were fifty years old. It is a fact which must diminish the popular belief that the Victorian age was one of privilege and deference. British Society has always been more fluid than its class structure makes it appear.

William Hesketh Lever, having become first Sir William, then Lord Leverhulme, was asked by the British Government to go into margarine production early in the First World War. Anxious to secure the country's supplies of edible fat and oils the Government encouraged Lever to make artificial butter, named margarine by the French chemist who invented it in 1869. This brought him into contact and competition with the Dutch concerns Jurgens and Van den Berghs.

After the war he involved himself whole-heartedly in an imaginative project to make the Outer Hebrides the centre of a vast fishing operation which would replace Russian and German imports with home-caught fish. He wanted above all to improve the lot of the islanders of Harris and Lewis. The scheme ultimately foundered on the opposition of the crofters, who refused to devote themselves whole time to the Lever enterprise even though, as his employees, they could make twenty times as much money as they could out of their crofts. Perhaps Lever understood this fierce attachment to the land. At any rate he gave up his venture without ill humour and generously made a gift to the local people of all that he had built But not before he had bequeathed an important legacy to Lever Bros. This was MacFisheries, a chain of fish shops designed to provide outlets from the Western Isle catchers to give his fishmongers additional supplies with which to tempt customers. He also bought out Walls sausages. The retail and food interests of Unilever are a direct consequence of this effort to aid the Outer Hebrides.

Meanwhile in the nineteen-twenties competition was becoming too intense in the soap and margarine business for the financial health of all the rivals. In 1929 a merger with the Dutch was consummated. Unilever was born. Similarity between British and Dutch legal and tax systems made the partnership a much simpler matter than expected; certainly much easier than a like project would be today.

With the end of World War II expansion carried the company far beyond the old limits of soap and margarine. The demand for instant packaged or fresh-frozen food soared. Margarine was no longer sold on its price tag but on such refinements as 'spreading straight from the fridge'. In the affluent society Unilever flourishes.

Simple soap has undergone a transformation comparable to that of Cinderella at the touch of the fairy wand. The old scrubbing soap has been overtaken by detergents. Here Unilever is in deadly rivalry with the United States concern, Procter and Gamble. Now one concern is ahead, now the other. Procter and Gamble stole a march by getting its 'biological' washing powder Ariel out before Unilever's Radiant. The Unilever men, however, are confident they will regain the lead. Household soap has evolved into toilet soap and again it is quality or its use by glamorous film stars or its luscious lather, rather than its price, which is the determining factor in selling Toilet preparations, shampoos, hair-fixers, for men as well as women, strive for that cleaner-than-clean look.

But it is in food that the most spectacular gains have been achieved, trebling sales between the end of the fifties and the start of the seventies. Walls started making ice-cream back in the twenties to fill in the summer slack season for pies and sausages. Hartop, a Dutch meat-packing firm joined the consortium at the same time. It has, however, been Bird's Eye, the frozen peas to fish fingers branch of the family, which has recorded the most sensational increase. Its 15,000 employees produce and market over eighty different products. Vegetables are grown under contract, with the company providing seed, advice at all stages of cultivation and ad-

vanced agricultural services based on continuous research. The farmer, as well as supplying Unilever, is also a customer for Unilever agricultural products in the form of animal compound feeding-stuffs.

It is arguable that a firm of Unilever's vast influence has done as much for British farming as parliamentary legislation – providing a stable market for high-quality produce, in pace-setting agricultural developments and in bearing research expenses beyond the scope of small farmers. The company has helped show successive governments that the British farmer is capable of heroic efforts, given the opportunity – and the advice. Ernest Woodruffe, the relaxed no-nonsense Yorkshire chairman of Unilever, remarks: 'Even the research department has its own market research budget so that people can check for themselves whether the public really wants the products they are dreaming up.'

Nor is Unilever a foe of the small man: just the reverse. Because of the expansion of 'own brand' products by some of the biggest supermarket chains, Unilever is anxious to sustain as many independent retailers as possible to market Unilever goods. Self-interest compels the giant to look with a friendly eye on the little trader.

Unfriendly observers have pointed out that while Unilever has more than 300,000 employees its total turnover is but two-thirds that of Shell International, which has only two-thirds as many workers as Unilever. The firm's return on capital employed during the sixties ranged from 28 to 10 per cent; as a percentage of turnover it went as low as 2½. Critics claim that the Anglo-Dutch giant performs less forcefully than American competitors.

But the quality of products is high and competition is successfully met. There are as many shareholders in Unilever as there are employees: some 200,000 in the United Kingdom, and over 100,000 throughout the Continent. One reason for Unilever's relatively low ratio of profit to turnover is the large number of African employees (80,000) in the palm-oil plantations of West Africa. Output per worker is naturally much smaller than in Europe, and this labour-intensive side

of the business explains why the capital per employee in Unilever is a mere eighth of what each Shell employee has behind him.

The historical reason for Unilever's being in Africa on such a large scale is that William Lever decided early in the century that he must safeguard his sources of raw material, particularly tropical oilseed. He established plantations of coconut palms in the Solomon Islands of the Pacific. He launched an oil-palm venture in the Congo. And finally, in 1920, he purchased the Niger Company which, allied to his other enterprises in West Africa, eventually became the United Africa Co.

United Africa is more than a producer and processor of oil and fats. It is a trader throughout tropical Africa on an enormous scale. In this capacity it imports motor vehicles, tractors, electrical machinery, building materials, pharmaceuticals, and sells them throughout the areas in which it operates. The company runs a chain of department stores known as Kingsway in the towns of tropical Africa. It also buys food and textiles in quantity from local concerns, and so stimulates African enterprise.

It is big too in breweries, plastics, cement, bicycles, packaging, timber. To promote exports like Nigerian and Ghanian timber the company runs the Palm Shipping Line, whose twenty-one ships sail between the West African coast and Europe. In addition United Africa has its own wholly owned port of Burutu for carrying merchandise up the Niger River and bringing produce down for shipment overseas.

Unilever is the prototype for the Euro-African company which will surely find many imitators as Britain becomes a fully fledged member of the European Community. In the economic life of tropical Africa Unilever is a concern of immense importance. It is more than a trading organization; it is a political factor for stability. Anyone who has seen a trading-station in Africa knows how vital such stations are to the neighbouring communities. They provide stock-feed for the cattle, fertilizer for the land, blankets, furnishings, colourful chat for the men—and tobacco for the women. In

accepting responsibilities beyond the purely commercial sphere companies like Unilever are planting the roots of natural economic growth in a continent which has more than its share of tribal conflict and political fragmentation.

Third among the Goliaths of British – and world – industry is Imperial Chemical Industries. This vast concern, responsible for nearly 3 per cent of Britain's total manufacturing output and 8 per cent of her annual investment in plant, is the second biggest chemical complex in the world and among the 'top twenty' of all firms. It is dominant in Europe where, incidentally, 130 of the 200 largest companies are British.

Like Shell and Imperial Tobacco, ICI was formed in response to intense foreign competition, principally American and German. On the morning of 22nd October 1926 newspapers reported that negotiations were far advanced for the merging of four firms, British Dyestuffs, Brunner Mond, Nobel Industries and United Alkali, into a new company to be called Imperial Chemical Industries. The pressures exerted by Dupont in the United States and IG Farben in Germany thus induced the British chemical companies to sink their differences and combine their technical and commercial services.

The classic defence of this move was made by Brunner Mond's chairman, Sir Alfred Mond (later Lord Melchett), a Jew who joined with Nobel's chief, the Scot Sir Harry McGowan (later Lord McGowan) to advance the chemical interests of England. Sir Alfred claimed: 'Modern mergers are not created for the purpose of setting up monopolies or for inflating prices. When managed by able business men they are created for the purpose of realizing the best economic results, which both capital and labour will share to the best advantage, to enable varieties of industry to form an insurance against fluctuations of markets and prices in individual products.'

Chapter 14

GIANT AT WORK

For the shareholder as well as for the workman, fusions act as a form of insurance against those risks in industry which are inherent and cannot be avoided even by the most skilful management. It is hard to quarrel with this argument. At the period when ICI was formed there was over-abundance of capacity. Without unification, the British chemical industry would have been driven to the wall and acquired piecemeal by the Americans. When from 1940 on expansion was substituted for contraction, only big organizations commanding huge resources could meet the national need, first in war and then in the fierce rivalry of peace.

The drawbacks of size – increasing bureaucracy, slowness of decision-making – are real, but they are the price to be paid for ensuring the survival of a national industry operating a wide spectrum of expensive, science-based projects. So it is with ICI. Only groups of this size can afford to spend £350 million over a few years on mechanical plant in the United Kingdom. Only research on a vast scale can sustain the production of refined chemicals which have application to farming, textiles, paints, plastics, packaging, pharmaceuticals, metallurgy, defence. Only a team big enough to play in the first league can 'trade' licences on a world-wide basis covering a multitude of products. ICI began the swapping business by giving its process for polythene to Dupont in exchange for nylon. This sort of exchange has been going on ever since with countries east and west.

ICI's domestic products in Dulux paints, Lightning zip fasteners, Terylene fabrics, Bri-nylon shirts, Savlon medical lotion, Weedol weedkiller, Propathene kitchen utensils, are well known to customers in the United Kingdom and overseas. They are all results of ICI research. The largest output

of plastic in the world—polythene—is an ICI invention. So are a host of other derivatives from petro-chemicals. The firm also has a £100 million stake in the rich North Sea Ninian Field, 110 miles north east of Shetland, the major find announced by Burmah Oil in April, 1974.

The size of ICI's operations on a global scale can best be appreciated by a few statistics. ICI employs 199,000 workers each backed by capital resources of over £10,000. It has 600,000 shareholders—representing one in every twenty-five households in Britain. They own assets of £2,143 million. There are 318 associated companies (compared with 500-plus for Shell and Unilever), covering every portion of the world. The company's world annual turnover in 1973 was £2,166 million of which 57% was in overseas sales, including a particularly marked increase in Western Europe. It exports directly from the United Kingdom some £400 million worth of products per year and makes a net contribution to the balance of payments (after deducting essential imports of raw materials) of £220 million. Its overseas subsidiaries, especially the Canadian, Australian and Dutch, are each in the £100 million turnover class. Indeed ICI's economic penetration overseas has been brilliantly conceived and formidably executed.

Under the main board are ten divisions—metals, paint, pharmaceuticals, fibres, heavy chemicals, explosives, plastic, agricultural, dyestuffs, fine chemicals. Each of these divisions has a chairman who serves on the main board and each division has subsidiaries and associated companies overseas. So important have the European and United States operations become that they now have their own 'super corporations' —ICI Europe with headquarters in Brussels and ICI America Inc. with headquarters at Stamford, Connecticut. In addition ICI in collaboration with Celanese has captured 25 per cent of the polyester fibre sales. One-third of ICI's assets are invested abroad. This represents a ninefold increase in the past two decades.

Europe is the prime target. ICI is now easily the biggest manufacturer of synthetics in Europe, and the most comba-

tive challenge to its position comes from another British producer, Courtauld. From the complex at Rozenburg, near Rotterdam, ICI furnishes the Continent with Perspex, Diakon moulding powder, Melinex film. Two plants feed the spinning-factory in Oestringen, Germany, with the raw material for nylon and Terylene.

Even Soviet Russia is embraced in ICI's trade-hungry grasp. Sales to the State-purchasing agents of Russia and the Soviet bloc countries rose thirtyfold, from £600,000 to £18 million in the sixties. A licensing agreement permits the Russians to manufacture polyester fibre at a factory at Mogilev. This is the largest single-site factory for such a purpose in the world and it was built by a British engineering consortium consisting of John Brown Constructors and Stone Platt Industries with ICI providing expert assistance. It is through agreements of this kind with the Soviet bloc that British chemical engineering concerns have broken the virtual monopoly of United States chemical (and oil-refining) plant-builders.

To compete in the same league as the United States, ICI is obliged to sustain a research and development effort in excess of any other British or European firm. Constant change is the theme. Old products must be replaced by new and because of the enormous scope of manufacture in the United States and the vast resources that can be brought to bear on any problem there, the gestation period between the decision to launch a new product and its appearance is about one-third the time for a similar process to be gone through in Europe. This is an important reason for ICI's consistent devotion to the cause of United Europe and British membership of the Common Market.

Sir Paul Chambers, ICI's chairman during most of the sixties, and his immediate successor Sir Peter Allen (author of a splendid book on golf, *Famous World Fairways* – itself a tribute to ICI's world-wide connections), were concerned with broadening the market for British products and with sustaining the company's intensive research effort.

The firm spends between 3 and 4 per cent of its total turn-

over, say £70 million a year, on research, most of which is conducted by the individual divisions. More than 12,000 people are employed on this work, of whom nearly 4,000 are science graduates. ICI's intake of graduates is, not surprisingly, higher than that of any other United Kingdom concern.

About 10 per cent of research expenditure goes on investigating matters likely to be of general background value to the industry; some 20 per cent on exploratory work that may lead to novel products or processes; 30 per cent is spent on improving existing methods and tools; the remainder is devoted to providing the plant and technical expertise to manufacture the fruit of the boffins' efforts.

Among the products of ICI research are Alkathene, Perspex, Diakon, the hormone weed-killer and insecticide Gamma BHC. On the pharmaceutical side there are Inderal for the treatment of certain forms of heart disease; Mintic, for treating worm diseases; and Zanil for treating liver fluke. In all, 50 per cent of ICI's home sales in chemicals in 1970 were products that were completely unknown before World War II. To keep up the pace of research, the company offers £150,000 worth of research scholarships annually in the British Isles and provides a similar sum to finance scientific exploration at the universities.

Sir Alfred Mond was the pioneer of welfare and sound labour relations. A permanent trades union advisory council was established in 1936 and this helps establish a basic wage rate and conditions. Grievances by individual workers or groups are dealt with by machinery set up in 1947, which speeds redress. Everyone at ICI is supposed to know how his or her work is evaluated. There is a joint consultation at works council level and at the top there is a central council of employers and employees which twice a year discusses pensions, profit-sharing, grading, safety, sickness benefits and so on.

The firm is particularly proud of its profit-sharing scheme, which has operated since 1954. Close on 100,000 employees qualify for an annual average bonus of 7·5p per £1 of remuneration or some £190 for a £50 per week employee and this

bonus can be used to purchase ICI stock. This is one reason why the company has such a wide spread of shareholders. Paralleling profit-sharing is a contributory pension system not only for the staff but for payroll workers as well.

ICI's progressive attitude on this score has clearly encouraged many other firms, with the happy consequence that the United Kingdom now has a higher proportion of its labour force covered by occupational pension schemes than any other country in the world.

Chapter 15

'FROM LITTLE ACORNS . . .'

Of course Britain International is more than ICI, Shell, Unilever, RTZ, Cunard and GEC, Imperial Tobacco, Dunlop, Pilkington Glass, Hawker Siddeley, Vickers, British Aircraft Corporation, International Computers, Tube Investments, Leyland, Electrical and Musical Industries (the biggest gramophone record company in the world) or the other giants of the industrial scene.

There are thousands of small enterprises which export successfully: from Continental Candy of St Anne's, Lancashire, which in 1970 won an order from West Germany for one million lollipops, to Joseph Rodgers of Northumberland who gained the contract to supply the Australian Army with 22,000 clasp knives, as once they had supplied General Custer of Custer's Last Stand with bowie knives.

Wilkinson Sword is an example of a 200-year-old firm which adapted itself to new challenges, attacked a market dominated by foreign products and succeeded brilliantly.

Founded in 1772, it manufactured fine swords and, when the demand for these weapons even in a purely ceremonial role declined, branched into gardening tools, where a reputation for superior quality justified considerably higher prices than those offered by competitors. Wilkinson's then was a family firm, the Randolph family, which had found a niche it could quite happily have occupied for many generations, when in 1960 something extraordinary happened. The company produced a razor blade that revolutionized shaving.

That was rather as if the British had taken to manufacturing chewing-gum or Coca-Cola. The wet shaving business was as American as Momma's apple-pie. It was dominated by the Gillette giant whose safety razor blade—invented by the aptly named King Gillette in 1895—was indeed king. In

the United Kingdom alone it was reckoned to hold well over 80 per cent of sales.

Gillette itself had been working for a year on the process by which Wilkinson transformed shaving, and took a somewhat sour view of the use made of it by the newcomer. Harry Randolph, the Wilkinson chairman who presided over the great leap forward and who was then, in December 1959, approaching seventy, explained: 'Our stainless steel razor blade is quite a different product from the Gillette blade and in our opinion very much better. The adherent coating (which gives the blade its special cutting edge) is only a very small part of the productive process and was discovered after years of separate research by both companies.'

Wilkinson paid Gillette royalties on the technicality that the United States company had lodged its patent five months before the British and it was not worth contesting the issue in courts round the globe. Wilkinson could afford to be generous. It had achieved a marketing 'break-through' (too often a misused term, but in this case genuine) of startling proportions. Within three years exports rose by 30,800 per cent and the blade was on the 'black market' in England. By 1970 production totalled 1,000 million blades a year, 46 per cent for sale overseas. Wilkinson held considerably more than half of the British market and had become as well known as its mighty rival Gillette in many lands.

Tradition. Grandeur. Style. Solidity. In short, the Best. That was the message Wilkinson conveyed in its advertising. To crashing, 'Rule Britannia'-style music, the television commercial speaker intoned, 'For nearly 200 years Wilkinson has been putting a fine edge on steel.' The glinting sword blades were displayed in a room redolent with the romance of Empire (Wilkinson still make 5,000 swords a year). The world's finest was the gist of the sermon. And the buyers accepted it as gospel.

In truth it was a fair claim. Quality control was sternly applied. Even when the factories could have sold each blade ten times over, 20 per cent of production was rejected because it did not come up to the demandingly high standard.

The raw material, strips of Swedish steel, is tempered and ground; chopped into blades; stropped by leather discs in air-conditioned rooms; examined under microscopes, then honed and inspected again under ultra-violet light, and finally passed fit for the customer. Without question this passion for quality is Wilkinson's strongest asset. But without a sales technique tailored to the product and projecting exactly the right image virtue alone would not suffice.

The sales 'gimmick' has helped to launch many an excellent product: the black patch to sell the immaculate Hathaway shirt, the bearded naval commander associated with Schweppes and so on. Wilkinson called on history—and made marketing history. The company even made a bullet-proof vest for President Nixon.

Commenting on the appreciation his company had earned Harry Randolph explained the reasons for success: 'First you have the right product. Second you've got to know your customers. To do business with people there must be a shared, almost intimate, knowledge as between a family. That sort of trust is built up only by frequent contacts. That's where the social side comes in. My wife always comes with me on trips abroad.'

And a word of advice to aspiring youth: 'Any young man who wants to be a successful salesman today must speak at least three languages fluently. The sales success formula is a mixture of the dignity, the quality and the poise of an Englishman with the Christian-name friendliness and the keen profit motive of American salesmanship. Above all, it is the . . . word of mouth praise that sells a product. I don't believe in competition by price. I believe in competition by quality.'

In this philosophy lies much of the inner character of the British. It is building a proud ship on the Clyde, a Rolls-Royce Silver Ghost where 'the loudest noise is the ticking of the clock'. It is 'VC-tenderness', the smooth, effortless power of the finest, most comfortable airliner in existence.

Another company which illumines the British genius in commerce was not born when Wilkinson celebrated its 175th year. It was built from scratch by the hard work and initia-

tive of two men. It was late in 1947 when former naval officer Leslie Smith and ex-private John Odell pooled their war-time gratuities and set up as die-casting commercial engineers in a derelict public house, The Rifleman, in North London. The two thirty-year-old ex-servicemen had no previous experience and no academic qualifications. They just wanted to be their own bosses and they happened to complement each other: Smith the engineer, Odell the one with the ideas.

In these immediate post-war years the two principal toy-makers to the world—Germany and Japan—were economically hors-de-combat. It was therefore a good period for new manufacturers to step in. That the Germans and Japanese have not re-emerged as leading toy-makers in the world market, as they have with motor-cars, ships and so many other products, is due in no small measure to the astonishing achievements of people like Smith and Odell.

The year of take-off was 1952. Queen Elizabeth II had ascended the throne. Everywhere the build-up was going ahead for the coronation, the first ever shown live on television. Odell and Smith conceived the idea of producing a miniature die-cast model, a little over one inch long, of the coronation coach with its team of eight horses. It sold for 2*s.* 11*d.* 'The response,' recalls Leslie Smith with relish, 'was fantastic. In less than nine months we sold more than a million.' Thus began the fabulously successful Matchbox series of model toys, so called because they fitted into cardboard containers no longer (though a bit deeper) than matchboxes.

Since the coronation coach a stream of cars has poured from the Lesney Company. Says Smith: 'As new cars go on the road so we introduce new models into our range.' Says Odell: 'Throughout the world new customers are born every second.' To keep pace with development Leslie Smith reads a hundred motoring and technical magazines a week from around the globe. He passes suggestions to his partner. John Odell then works on the technical problems and if necessary

invents machinery to cope—such as a special machine that sprays silver headlamps on tiny bodies.

But while up-to-the-minute methods that parallel in miniature every advance in auto-engineering account for some of Lesney's sale of 1,000 models a working minute, a major factor in the company's progress has been nostalgia, catered for by replicas of cars of yesteryear.

The British are probably more nostalgically minded than most. But the rest of the world is beginning to share this enchantment with the bygone, and when the British 'go nostalgic' in a commercial manner they usually do it well—and profitably.

So it has been with Lesney's yesteryear models. Small children, it seems, want to know what grandfather's motor-car looked like. To satisfy the curiosity of the young and extremely well-informed customer Lesney go to extraordinary lengths to ensure correctness of detail. John Odell says: 'To make sure we were absolutely accurate when we brought out our "Yesteryear" model of a 1911 Maxwell Roadster we sent a team to Texas to take photos, measurements and do on-the-spot-drawings of the real thing.'

But in business, of course, nothing stands still. Having set Britain on the path to the top of the toy league in company with other United Kingdom manufacturers like Airfix (whose build-yourself models of aircraft satisfied youthful skills), Lesney was suddenly challenged by the ever-restless Americans. Astonished, maybe appalled, by the swiftness of the British takeover of the toy trade in 130 countries the ingenious technicians of the States hit back with Hot Wheels. The Nuttal Corporation of New York introduced this excellent little machine to the public in March 1968. By fitting a tiny plastic bush to the axle the makers enabled the car to go an incredibly long distance at the slightest push. Lesney were shaken. 'It is an understatement,' they admitted, 'to say we were annoyed at being beaten by the Americans with this idea of friction-free wheels. They took the whole trade by surprise and stole a march on all of us.'

The counter duly came. It was Lesney's 'Superfast', able

to travel 20 yards at the touch of a child's finger thanks to reducing the surface area between moving parts: wafer-thin axle rods, spring-steel wire. Costs were on Lesney's side: 2*s.* 4*d.* against the American model's price of 5*s.* 11*d.* 1972 was a good year for Lesney.

Yet the American move was a sharp reminder that laurels are an award for achievement, not for sitting on Smith and Odell of Lesney now know that. So do the Randolphs of Wilkinson Sword. They exemplify the questing talents of British free enterprise—market, cost, and quality conscious at its most effective. Their achievements testify to the virility of private initiative, whether it is building on centuries'-old tradition or starting from scratch. And they are far from alone.

Chapter 16

THE RIGHT MIX

The mixed economy is a British term for a very British kind of situation where edges are fudged and no one takes up an unconditional stance. British Petroleum is basically a free enterprise venture of which even home-grown Socialists approve. It has the State as by far its major shareholder, with the enthusiastic endorsement of the Conservatives. And to complete this party truce it was Winston Churchill, then Liberal First Lord of the Admiralty, who bought the stake in BP (then known as the Persian Petroleum Company) to secure oil supplies for the Royal Navy.

William Knox D'Arcy, an Englishman who had made a fortune from goldmining in Australia, became interested in the possibility of finding oil in Persia, where from ancient times traces had been known to exist. On 28th May 1901 he was granted an oil concession by the Persian Government, valid for sixty years Under immense difficulties exploration began. The first well was drilled in November 1902, but was unsuccessful. Further wells failed to find oil in commercial quantities, and because of grave lack of funds a syndicate was formed with D'Arcy as one of the members, with the participation of the Burmah Oil Company. Operations continued and in January 1908 drilling began at Maiden-i-Naftun (later renamed Masjid-i-Sulaiman, the Temple of Solomon) and on 26th May oil was struck in commercial quantities, almost seven years after the grant of the concession.

As a result the Anglo-Persian Oil Company was formed in April 1909 to operate the original D'Arcy concession. A site for a refinery was chosen on a barren mudflat called Abadan, on the Shatt-al-Arab. A pipeline connecting it with the Masjid-i-Sulaiman oilfield was completed in June 1911,

and Abadan Refinery became fully operational in 1913.

For fifty years British Petroleum soldiered on in the increasingly difficult zone of operations—the Middle East. Its performance was dull compared with other glamorous oil companies because it had to tread with extra caution. The forties and fifties were decades of surging Arab nationalism, and the foreign, particularly British, oil companies were prominent targets for the wrath of Arab politicians. The greatest blow to the company's fortunes was the nationalization of the Abadan Oil Refinery by the ageing Persian fanatic, Mohammed Mossadegh, in 1951. At one blow Britain's biggest single foreign asset vanished. True, a partial recovery was made three years later after Mossadegh had been overthrown by the Shah, but in place of sole ownership BP had to share its Persian riches with other foreign-owned members of a consortium. At the time the activities of the United States Government and American representatives in Persia were not exactly conducive to the promotion of British interests. America allowed the British case at the United Nations to go by default. In fact the Americans reaped as much benefit as they possibly could from the humiliation of the British. By a strange irony it was America which was to restore BP's wealth nearly twenty years later.

Forced by difficulties in the Middle East to switch from selling crude oil wholesale to retailing its own petrol, BP widened its marketing appeal and moved into Europe with a flourish. By 1966 it had risen to be one of the top three oil companies in the world. Now its appetite was really roused and the company chiefs looked towards the richest market of them all the United States.

Heavily taxed (being U.K. based BP is the most heavily taxed oil concern in the world) and short of liquid resources, BP had to exercise skill and discretion in choosing sites to explore when vast areas of Alaska went up for auction. In 1965 BP purchased thousands of acres of the North Slope for $1 million. Dr Peter Kent, the chief geologist, comments: 'We quite deliberately avoided the terribly competitive place (the southern area) and moved north knowing we

could do better. But it was an enormous act of faith by the management to support us.'

Carrying the burden of responsibility was Eric Drake, chairman of BP. He was also faced with a dilemma. The only purpose of discovering crude oil in Alaska was to refine it to supply the American market. That meant buying refineries and a chain of petrol stations. One such chain was presented for Eric Drake's consideration: two American groups, Atlantic Richfield and Sinclair, were merging.

To avoid the charge of creating a monopoly of selling outlets on the eastern seaboard of the United States the companies offered to sell 10,000 filling stations to BP. But the cost of purchase was $300 million. Should Drake buy—only to discover there was no oil on the North Slope of Alaska; or should he pass up the opportunity and discover that he had no market for the oil once it was found? He observed, '. . . we couldn't hope to have another look next year . . . we had to decide in two or three days. One's whole training is to take decisions and one takes them.' It was the right one. BP's Alaska exploration gushed. And gushed after its American partner in the venture, Sinclair Petroleum, had pulled out convinced there was nothing there.

Now two more problems remained to be solved. The first was technical. Between Alaska and the east coast of America lay about 3,000 miles. How to get the crude oil to the market? Get refineries in between. 'Ask and you shall receive.' 'Knock and the door shall be opened unto you.' Standard Oil of Ohio was in the right place and was willing to sell. Under a neat deal BP offered to buy a controlling interest by 1974 with the sale of oil it had found in Alaska. Thus America paid Britain in full for Abadan.

The other issue was American legal practice and United States readiness to concede ground to an outsider on her own soil. Under American anti-trust legislation BP's link with Ohio was suspect because it created a local monopoly, or at least a dominant position. Had the United States Justice Department applied the rules legalistically the merger might have been frustrated, but political considerations intervened.

The United States was under mounting attack for its penetration of other markets, especially the British. In the United Kingdom every second car that pulled up at a filling-station was built by an American-owned company, and every second filling-station served American-owned petrol. For BP to be excluded from the American market—whatever the ostensible reason—would provoke violent recriminations and charges that America was playing the trade game unfairly. Inevitably pressure of public opinion would push the British Government into taking discriminatory action against American concerns. Thus the advice of the State Department to the Justice Department in Washington was not to press the legal case too hard. In consequence the BP–Ohio merger went through.

British Petroleum, third in Europe, may soon become third in America. An outstanding achievement for a company which until 1965 had no domestic resources whatsoever. In that year BP discovered natural gas under the North Sea, thereby adding another 'first' to a formidable list which includes: first to produce a lubricant for supersonic aircraft; first to fuel the commercial Hovercraft; first with multigrade oil; first to introduce self-service banknote accepting pumps; first to produce protein from petroleum. More recently BP has made a major North Sea oil strike with its Forties field off the north-east coast of Scotland which starts producing in 1975 and is expected eventually to yield some 20 million tons a year.

Here is a world-wide organization which comprises 500 subsidiaries, operates 46,000 service stations in 80 countries; controls or has access to one-fifth of the world's crude oil reserves, is second only to Shell in the size of its tanker fleet and is one of a handful of firms which are big in the spheres where growth is most spectacular: power, chemicals, aviation, leisure—which covers motoring, boating and even hotel ownership. BP owns motels in Scandinavia and motor camps in Turkey, bringing cities and historical sites within the orbit of the Western tourist, who is assured of high standards of hygiene, food and amenities.

Among the most impressive of BP's advances has been its agricultural research in developing a special tractor oil, fuel for crop-drying equipment and controlled heating for intensive livestock breeding.

It is notable that all the biggest British concerns—ICI, Unilever, Shell and BP—have contributed substantially to agricultural progress, and this partly explains the dramatic advance of British farming into the forefront of world food production. For without question British agriculture *is* an economic miracle.

Chapter 17

MIRACLE ON THE LAND

Like so much else in Britain, farming improvement is traditional. It is the marriage of venturesome, restless minds and a feeling for natural growth: 'engineering with green fingers'. Sentimentalists deplore the decline of countryside crafts, but in England they have been declining for two centuries.

The agricultural revolution and the industrial revolution were twin products of British genius. Indeed the one would not have been possible without the other. To feed the growing numbers of people who poured into the towns domestic agriculture had to expand. Under the promptings of scientifically inclined landowners such as Lord Townshend farming responded to the new challenge. Enclosures, crop rotation, drainage, reclamation—the reforms went on apace. There were hardship, suffering and hideous social blunders. There were long periods of depression, firstly after the end of the Napoleonic wars when grain prices collapsed, then the slower, less dramatic, yet more serious erosion of home farming caused by the tariff-free grain imports from the American West and finally of refrigerated meat. By the close of the nineteenth century, many observers, especially those espousing the extreme Manchester school of economic liberalism, concluded that Canada, Australia, New Zealand, the United States and Latin America could supply the United Kingdom with all its food requirements far more cheaply and efficiently than could her own farmers. The doctrine of the division of labour was explicit on this issue. Each to the occupation to which he was best suited.

Clearly Britain should devote her energies exclusively to the manufacture of goods and leave it to others to stock her larder. In this way the grand total of production would be enlarged to secure the abiding prosperity of all. It was hard

for the champions of British agriculture to contend with this facile case, expressed as it was by the shrewdest economists and most articulate commentators.

'The Continent will not suffer England to become the workshop of the world,' Disraeli had warned those who were proposing to sweep away the last remnants of agricultural protection. But protection *had* been swept away. And the result had been a gratifying increase in national wealth through the operation of free trade. True the Continent, more particularly Germany, was not accepting British industrial supremacy as an unchanging fact of existence, but there was room for everybody in the bright future of assured progress.

What answer did the knights of the shires have to this? How could the bucolic squires or the stout yeomen deny these truths? They didn't. The guns of August 1914 provided the reply. The Great War shattered for ever the illusion of continuing progress. As Napoleon's decrees had done a century before, the Kaiser's submarines now provoked a complete change in official policy towards farming. Uneconomic land was pressed into use. Allotments sprang up and millions of men and women rediscovered love of the soil.

Peace and the slogan 'Back to normality' brought slump conditions once again, but the Second World War wrought the agricultural revolution which can justly be described as an economic miracle. The old trust in a proper order of things, shaken by the first war, was annihilated by the second. Everyone knew the delicate mechanism of global specialization could never be put together again. So British farming got what it had lacked for many weary decades: a policy for growth, backed by an informed public opinion.

At first expansion was haphazard. Drawing on Great War experience, allotments reappeared, open spaces were commandeered. Young women, known as Land Girls, were given rudimentary training in agriculture and hired out to farms to supplement the labour force. Efficiency targets were set and if farmers failed to hit them they could be deprived of their land. This ruthless practice was widely and swiftly

condemned, but it did establish a standard for measuring farming practices. The Puritan streak in the British character was very much in evidence in the war years, and pride at living on short commons and on 'feeding ourselves' was general. The terrible havoc wrought by the war and the shortages in the aftermath persuaded politicians of all parties to support home agriculture as they had never done before.

Few happenings are as boring as politicians claiming credit for measures which, by common effort, have contributed to the public welfare. The Agricultural Act of 1947, foundation of British farming policy, was framed by a Labour administration and passed into law by a Labour majority. It was, however, the fruit of war-time knowledge and it answered to the deepest instincts of old Toryism. It provided one of the few occasions when politicians on both sides are justified in saying: 'We deserve the people's thanks.'

Its purpose was to give agriculture an assured place in the home market. This was easy to proclaim and comparatively simple to attain in days when one person's weekly ration of fillet steak could be fitted into a matchbox. The problem was how to get food, as much as possible, from severely limited resources. The solution proffered by the 1947 Act was to encourage intensive farming by a series of production grants designed to increase the yield from marginal land which would barely give a living to a farmer in free market conditions. So great was the need for home-grown food that capital was promised for every farmer who could make out a reasonable case. As a result, affluence descended on those farmers whose land was far above the margin. Forms there were in abundance. For, in order to ensure orderly marketing, various boards—notably for milk, eggs, potatoes—purchased most of the farmer's output at agreed tariffs and sold it to wholesalers. Two main methods were adopted to secure stable prices.

The first was a direct food subsidy, provided from general taxation to keep shop prices down. The trouble with the customer subsidy was that it came to be regarded as a magic

way of preventing a rise in food prices. An open-ended situation of this kind could not be maintained indefinitely without imposing an intolerable burden on the Exchequer. The Conservatives abolished it in 1951. They did not, however, abolish the deficiency payment system which, unlike the food subsidies, was an integral part of the 1947 Agricultural Act Under this system farmers were paid the difference between the lower world price of commodities and that which would tempt marginal farmers to stay in business. These deficiency payments were modified by the Conservative government elected in 1970 and progress was being made towards a system of levies on imports, so as to bring British policy into line with Common Market practice following Britain's entry into the European Community in January 1973.

An obvious conflict of interest exists between an administration—any administration eager to cut outlays on farming and the National Farmers' Union whose job is to win the biggest possible return for its members. Since 1956, when the last global food shortages vanished, the farmers have found these annual negotiations tougher and tougher. They have been obliged to absorb increased costs instead of having them automatically refunded. A fair number of farmers, especially in the rich farming lands of central-southern England, have been well able to do this. The jibe that the biggest injury a farmer was likely to receive would be caused by his falling over his wallet had considerable justification in certain years.

Public gratitude to and admiration for farmers is tempered by the view that they have done pretty well out of the system, which is only fair considering how splendidly Britain has been served by her agriculture. From 1940 to 1970 farming productivity—output per employee rose fourfold despite the loss of a million acres to housing, roads and airfields.

The value of Britain's agricultural production, £3,000 million a year, is one-third greater than that of Canada and equal to the combined output of Australia and New Zealand.

Although a mere 3 per cent of the country's labour force is employed in farming they earn the nation 50 per cent more than the car industry and twice as much as the coal-mines. So efficient are British farms that they have kept food prices down to a most remarkable extent. In 1974 prices of steak, eggs, milk, bread, butter and potatoes were the lowest in Western Europe except for Spain While farming output rose by 25 per cent in the nineteen sixties, farming income in real terms declined by 2 per cent. This is why the British enjoy the cheapest food of any industrial country in the world.

Today British farming supplies two-thirds of all the nation's temperate food requirements, twice as much as was achieved pre-war. In addition the farms export over £100 million worth of produce per year. Success breeds success. Once the decision had been made to promote home agriculture money, skill, ideas were attracted to it. Experimental farms flourish. Some are financed from public funds, as at Wye College, Kent; others are free enterprise ventures backed by wealthy business men happy to make a tax loss on an agreeable hobby. It is an ill wind . . . and it blows exceedingly favourably for farming because the men who run such farms are superbly equipped professionals whose practical experience spurs on agricultural improvement and sets the pace for neighbouring farmers eager to milk ideas as well as cows. Finally there is the interaction between large manufacturing concerns and agriculture. Because British farmers have been encouraged to make the most of their land a thriving agricultural machinery industry has been created which now exports 80 per cent of its output. Thus farming aids national finances, not only by substituting home-grown food for imported but by stimulating industrial exports too.

Even more significant in the success story of British farming is the part played by food-manufacturing concerns in providing scientific advice and planning programmes. Consider, for example, Silcock and Lever's Project 360. The purpose of Project 360, named after the IBM computer Model 360, is to define levels of feeding for individual cows

on a weekly basis throughout their entire period of lactation, i.e. milk-yielding. By completing a basic record or Barn Sheet containing the identity of the cows ('Maisie', 'Daisy', 'Linda', etc.), and supplying details of feed, peak yield and total milk produced in each of the four preceding weeks, the farmer receives a remarkable service. The information is collected by the local Silcock representative, fed into a central computer, and scientifically collated advice flows out. A weekly feeding-chart is compiled which will give the farmer the best output for the most economical amount of concentrated feed The yields of cows calving or going dry are predicted and the milk production from the rest of the herd is adjusted for these predictions to produce a weekly adjusted herd total.

The rate of decline in yield per week over the whole period is calculated, and a printed warning appears if milk yield is declining too rapidly. The cause is something for the farmer or his stockman to find out. The computer's warnings may well prevent untold damage being inflicted on the herd.

The computer also reminds the farmer when the cow is approaching the period when it should be served. As each cow calves the interval between this and the previous calving date is shown, together with the number of days dry. After a full year on Project 360 the farmer is given up-to-date information comparing four-weekly period performance with the same period in the previous year. Every herd is reassessed annually on the previous twelve months' results. Newly calved cows are given a rate of feeding appropriate to the previous year's results and continue to be fed on this basis until succeeding information dictates a change.

Silcock and Lever insist that the major responsibility remains with the farmer and the cowman. 'A computer,' says the firm, 'cannot cover inadequate feeding or infertility. It will, however, faithfully point out the results of either of these where they are allowed to go unchecked. Project 360 is not a substitute for stockmanship, it is a support.'

It is a support which farmers clearly find worth while. Farmer Stone of Laverdale, Carlisle, reports that the yield

of his seventy-eight Friesians increased by thirty-seven gallons a cow. The average size of herds on Project 360 is sixty cows. Allowing for the most effective use of concentrates prompted by the computer's advice the savings made or the gains achieved work out at £319 a year. Farmer Reynolds of Llanddewi Velfrey, Narbeth, Pembrokeshire, with a herd of forty-four Friesians, records that 'Project 360 has helped me to feed cows accurately now that labour shortage prevents me from recording regularly'.

This is the key. As labour supply grows shorter so the British are turning to ingenuity. Agricultural inventiveness is very much in their tradition. The first major agricultural machine, a seed-drill, was invented by an Englishman, Jethro Tull, in the eighteenth century. Another Englishman, Dan Albone, developed the first practical gasoline-driven tractor in 1897. By 1938, 10,000 tractors were being produced. Thirty years later this total was over 200,000—including a robot model—and the United Kingdom had become the most mechanized farming nation in the world, with over half a million tractors in use, one to every thirty-six acres of arable land. Among other equipment are 65,000 combine-harvesters, and big numbers of crop-sprayers, pick-up balers, hop-pickers, potato and sugar harvesters. Britain is the biggest producer of ditching and hedge-cutting machines and supplies half the world's tractor exports.

The astonishing aspect of this achievement is that it has been accomplished from such a narrow base. Britain, with the smallest agricultural force of any major State, has actually set the pace for the development of such exotic advances as a complete harvester for groundnuts, threshing machinery for rice, a cultivator for semi-arid soil, a prairie-buster plough, as well as the world's first farm tractor employing hydrostatic transmission, and universal potato and vegetable harvesters. These last three were invented at the National Institute of Agricultural Engineering at Silsoe, Bedfordshire.

The partnership between the nation and the farmer is close and immensely fruitful in Britain. Although still fervently wedded to individualism—nearly half the 422,000

farms in the United Kingdom are owner-occupied and worked single-handedly by the farmer and his family—not even the most doughtily independent would deny that government encouragement has been essential to the expansion of British agriculture over the past forty years.

It was in 1931, a year of total depression, that the Agricultural Research Council was established. With a budget of £15 million a year it controls twenty-four research stations and gives grants to independent organizations. One of the major beneficiaries is the Experimental Station at Rothamsted in Hertfordshire, which was founded in 1843.

But research into improving husbandry would not have saved British farming at this period—a measure of the decline is the fact that the area under wheat, 1,097,000 acres, was only about one-quarter of that in 1970 and the yield per acre was less than half—had Parliament not enacted a host of legislative measures. The Imports Duties Act of 1932 laid the foundations of recovery. Duties were imposed on all food from overseas except Empire lands, and an advisory committee was established to keep tariff changes under constant review. Under the Ottawa Agreement of the same year the Empire lands agreed to a quota system which preserved their right of non-taxed access to the United Kingdom market, but limited their meat and dairy exports. Then came the first of a series of marketing Acts to regulate the production and distribution of perishables.

The first and most strikingly successful of such Acts was the one establishing the Milk Marketing Board. The Board —or more accurately five boards covering the whole country —controls the sale of milk. Prices realized vary according to the use to which the milk is put. The full guaranteed price is limited to a standard quantity plus bonuses for quality, representing the amount required for liquid consumption plus a reserve to ensure adequate supplies throughout the year. Milk for butter and cheese has to be sold in competition with imported products, although the Board has throughout the years made long-term agreements with dairies and cheesemakers to assure them of regular supplies.

The milk bars were a consequence of the Board's commercially minded policy. So was the 'Drinka-pinta-milka-day' publicity campaign. Biggest of all aids to milk consumption, however, was the school's cheap milk scheme inaugurated in 1934 by which children could buy a third of a pint for one halfpenny. Poor children were given milk free. The effect of all this was to be demonstrated in the much better physical state of British youth.

All fleece shorn from British sheep is purchased by the Wool Board. The wool is normally sold by public auction, and if the average realized price is less than the fixed guaranteed price the deficiency is met from a stabilization fund, which also gets receipts in excess of the guaranteed price.

Notable for its attempt to marry the needs of the underdeveloped Commonwealth with those of the domestic farmer is the arrangement for sugar. Set up under Acts of 1954 and 1957, the British Sugar Corporation buys the whole of the sugar beet crop from an annually specified acreage produced in the United Kingdom at fixed prices. The Corporation refines the sugar and sells it, under market-sharing agreements with other refineries, at a price based on the world price. The Sugar Board buys Commonwealth sugar at a 'negotiated price' and sells it commercially. If there is a global glut of the commodity a deficit in the Corporation and Board's account will emerge, which is met by levies imposed on *all* sugar, home-produced or imported. If there is a shortage of world production a distribution payment is made from the surplus.

It would be idle to pretend that all the marketing boards have been unqualified triumphs. Yet the attempt to combine orderly marketing with individual freedom has been remarkably successful. Without protection British agriculture would have vanished, engulfed in a flood of imports. Had that happened, Britain would have been hostage to her suppliers, a prey to every sudden change in world food production and politics.

Other parliamentary provisions have promoted the health of British farming. Production grants are provided under the

Agricultural Act of 1957 for meeting the cost of fertilizers; ploughing land that has been under grass for at least twelve years; encouraging the rearing of calves for beef; helping farmers to keep records as an aid to sound management decisions; destroying pests. Long-term investment in farm buildings and equipment is promoted by grants to cover the cost of installing electricity and to keep roads, fences and ditches in good repair. The Agricultural Act of 1967 provides grants for expenditure on tractors, self-propelled harvesters and fixed storage equipment.

In countering animal diseases the husbandry services of the State have been outstanding The Veterinary Service, inaugurated more than a century ago, keeps constant watch on disease. For decades now the United Kingdom has been almost free of such serious plagues as rinderpest, sheep scab and rabies Swine fever has been eradicated. Wherever foot-and-mouth outbreaks occur they are met by a ruthless and costly slaughter policy. The purpose of this apparently heartless approach is to keep intact Britain's magnificent reputation as the breeder of fine cattle. Further animal health precautions are secured by reducing to negligible proportions the incidence of bovine tuberculosis. All cattle are tuberculin-tested at regular intervals. Reactors to the test are slaughtered and compensation paid to the owners by the Government In April 1967 the brucellosis scheme was introduced as the first step towards the elimination of brucellosis among cattle. A careful check of the effect on animals of chemical pesticides, weed-killers and crop sprays is kept by a government advisory committee, which recommends safety precautions.

Chapter 18

SERVING THE CUSTOMER

'A nation of shopkeepers' was Napoleon's angry jibe and grudgingly envious description of Britain. An instinctive feeling for trade built Britain's fortune. Nowhere has that instinct been truer than in serving the nation's customers. 'Shopping' in Britain is still as much a social exercise as an economic one. It may become even more social as living standards rise and prices become less important. For that reason the supermarket is unlikely to make as complete a conquest of the United Kingdom as it has done of the United States. When resale price maintenance (the price decreed by the manufacturer of a product at which the retailer was obliged to sell to the customer) was abolished after 1964 observers saw it as the death-knell of the corner shop. Large chain organizations, it was argued, would use their power of bulk purchase to squash the little man. As has been shown earlier that did not happen. The public decided that personal service was a quality worth paying for, and the independents often banded together in voluntary associations to resist successfully the encroachment of the multiples.

Yet while the small shopkeeper continues, in the main, to flourish the giant stores deserve credit for keeping down costs and providing a large variety of excellent products for the British consumer. Prominent among the big groups offering outstanding value are Sainsbury, Tesco, Boots, Marks and Spencer and Great Universal Stores, which includes such well-known names as Burberrys, Scotch House, Willerby Tailoring, Times Furnishing and others, as well as mail order companies. The honours system has been adapted to give recognition to enterprising store-owners: hence Lord Sainsbury, Sir Jack Cohen (Tesco), Lord Trent (Boots), Sir Isaac Wolfson (Great Universal) and Lords Sieff

and Marks (Marks and Spencer). These stores have been given another accolade: they have been described by American supermarket chief, Michael J. O'Connor, as 'better than anything in the States'. As the Americans were the pioneers of the giant stores—and indeed at one time owned Boots—that is a tribute of no mean measure.

Sainsbury's is the oldest of the five and is still a family concern, headed till 1967 by Lord Sainsbury (who received his peerage from the Labour Party) and now by his son John, the fourth generation of Sainsburys. It is entirely British that a millionaire grocer should be ennobled by the party of the toiling masses. This is the dash of Irish in the English which stops people from taking politics too seriously. At any rate it is as a tradesman, not as a politician, that Lord Sainsbury is to be judged, and he deserves his peerage on that score without question. A descendant of John Sainsbury who set up shop in 1869 to sell butter, cheese and bacon to the working classes, Lord Sainsbury has raised the tone of his 242 stores to middle-class tastes.

It was in 1949 that Sainsbury decided to follow America's lead and develop self-service techniques. For three weeks two of the family toured supermarkets on America's East Coast, returning to the *Queen Elizabeth* 'to get some sleep'. Their conclusion: 'We cannot afford to ignore American experience in spite of different circumstances.' Steadily turnover was pushed up—to over £300 million by the early seventies—and trade per square foot is far better than for any comparable business. In 1973 the firm went public.

Tesco is the newest, brashest group of stores, relying heavily on the 'razzamataz' of United States' marketing methods. Founded by Sir Jack Cohen, who established his first stall with his First World War demobilization gratuity, Tesco has grown from a simple shop in 1925 (the name was formed by joining T. E. Stockwell—his early partner—with Cohen) to a huge concern of almost a thousand stores, offering standard products with the maximum of entertaining and the minimum of overheads. This is old-style barker selling, with trading stamps, bargains, special offers, piped

music, dayglo posters and all the ballyhoo This is the real workers' revolution· far more jolly and valuable than any dreamed up by Karl Marx.

Jesse Boot's Nottingham dispensary has burgeoned into the largest retail chemist business in Europe. For a period in the nineteen-twenties it was in United States hands and was sold back to British interests only because the slump in the early thirties forced United States interests to cut back on investments overseas. Boots challenges the manufacturers of drugs, medicines, tooth-brushes, powders, etc., with its own-brand products of astonishing quality at extremely low prices.

Great Universal is the clothing empire of Glaswegian Isaac Wolfson, which straddles customer preference from teenage fashions to high-quality men's wear. Like so many other British trade tycoons of today Sir Isaac had humble beginnings.

But perhaps the brightest jewel in the crown of British retailing is Marks and Spencer. This is more than a business. It is an institution which has smoothed out class differences more effectively than any amount of 'social engineering'. The firm could not have had a more modest start in life. Michael Marks was a Jewish refugee from Tzarist Russia who found his way to Leeds and, in 1888, set up a penny bazaar. He hit upon a happy slogan: 'Don't ask the price—it's a penny!' Unknowingly he had captured the whole essence of Marks and Spencer's business. Michael Marks and Tom Spencer, his partner, flourished. They bought up small manufacturers' entire output of minor trimmings—buttons, laces and so on. But it was not until the twenties that Simon, Michael's son, transformed a good business into a fantastic one. He had entered the firm in 1907 just before his father died at the early age of forty-five, and succeeded to the chair in 1916. Six years later he visited the United States, where he was impressed by Woolworth's merchanting method.

His aim was to buy centrally, distribute to branches and

thereby cut out the wholesaler. As Goronwy Rees says in his book *Saint Michael* (the firm's brand-name): [1]

> Under the chain-store system of organization the scale of the retailer's operations were such that the orders he placed with the manufacturer would justify long, continuous runs of production and so secure the consequent benefit of economies in cost. It was a further and fundamental principle in Marks and Spencer's conception of retailing that these benefits should be passed to the consumer and thus contribute to a further expansion of the market.

This was Marks's major contribution to retailing, to textile design and to the context of 'trading up' to the new mass market.

Until after the First World War Britain was essentially a class-structured society; a deferential community in which everyone knew his or her place (whether they agreed with that place is another matter) and retailing and consumer manufacturing activities were directed to the particular class markets.

Each type of household was supplied with different kinds of products. The food which a 'high-class family grocer' (the term was still in use in the 1940s) supplied, differed much from that bought by a working-class household. So it was with furnishings, household goods and particularly clothes. Clothes, above all, were the badge differentiating the social groups. The humblest counter-hand in a top-class milliner could tell if a customer were from the aristocracy or merely aping the habits of her betters. So organized, so sensitive to nuances and jealous of their reputation were retailers that they rarely stepped out from stations into which God or the market—had called them.

America had never known this stratification. Her people were free-ranging and her industry reflected the fluidity of her society. Nothing shows the contrast more clearly than the history of the automobile. In the Britain of 1919 it was

1. Weidenfeld & Nicolson, 1969

produced, in the main, as a luxury for the upper and middle classes, in small quantities and endless variety. In the United States Henry Ford had directed his vast energies to turning out as many Model T's as his factories could mass-produce, at a price which created a vast new market. Standardization meant uniformity, but that was just too bad. 'They can have any colour they want,' Ford was supposed to have said, 'so long as it is black ' In the United Kingdom 'Milady' was politely asked if she would prefer the coachwork to be duck-egg blue or primrose.

As with motor-cars, so with less expensive products. America pioneered mass selling to a standardized market; the 5 cent stores, such as Woolworth's, brought it to the ultimate. What they did not do anything like so successfully as Marks and Spencer was to trade in quality products on a mass scale.

This was the Marksian revolution. And the man who sensed the social change, turned his business to meet it and made change his ally was Simon Marks. He realized that the First World War had brought about a great levelling process. He began furnishing his green and gold stores to meet the demand of the young typist and the needs of the factory girl who twenty years before might have gone 't'mill' in clogs but now wanted the same kind of clothes as she saw being worn by film stars.

With the power of bulk purchase Simon Marks was able to impose his will on his suppliers. They were happy to oblige when it was shown he had gauged the market to a nicety. The rightness of the customer was the fundamental trading principle. If she was not satisfied she must be allowed to change her mind. Cheapness, while a fortunate consequence of bulk-buying of a limited line of products, was not the first consideration. Quality of design, cloth, colour, fashion was of far greater importance. New and improved production methods were given considerable stimulus by Marks's constant search for value: value for his stores, value for his customers.

This market-orientated approach has proved immensely

useful to British industry. Simon Marks described his company's close association with Imperial Chemicals:

> Such co-operation would not have been possible without a common philosophy, based on the simple assumption common to both organizations that it is quality that counts. It costs comparatively little to incorporate into a fabric the technical improvements which are now at our disposal; and ICI as basic producer and ourselves as distributors of large quantities of garments, share the common interest of inducing manufacturers and suppliers to use the best available materials, fast and beautiful dyestuffs, yarns and fabrics that stand up to hard wear and tear and washing.
>
> To have narrowed the gap that necessarily exists between the producer of basic materials and the distributor of garments seems to me one of the most important results of our association. It has appreciably accelerated the introduction of many new varieties of Terylene and helped to make many new garments quickly available to our customer. It has helped ICI to increase the production of Terylene with greater confidence and to direct it into those channels in which consumer demand could be anticipated.

This last sentence is of high significance. British manufacturing industry has been weakest in its marketing technique of finding out what the customer wants — or may reasonably be persuaded to want — and supplying that, rather than what the manufacturer believes he or she ought to want. Simon Marks helped enormously to correct that weakness.

Lord Marks and Lord Sieff were convinced of the skills latent in the British textile industry, which in its early days had clothed most of the world. They realized that if it were harnessed to the new mass market it could meet the challenge. They and their staff mapped out the course.

Thus Marks and Spencer's head office study outlined the atmosphere in which design ideas and technology could best combine:

A great creative development begins with a vague idea of what is wanted and a clear idea of what is not. The vague idea is crystallized into a series of 'failures' until the object is achieved. To make a significant contribution to a development, the technologist must have in mind the same vague ideas as the commercial executive and, as vague ideas are difficult to communicate, he should acquire for himself the same background of ideas and experience. Such an identity of experience cannot be formed by periodical meetings, and the technologist should immerse himself in the life of the departments in the office and in the stores. He should share the experience which form the ideas and, possibly, may help to provoke them.

To advance this concept training on a broad front forms part of the Marks and Spencer recruit's curriculum. Always the aim is to make the newcomer aware that he or she is part of a team. Here the paternalistic streak, which is deep in the British (and Jewish) character, plays its part; the same family-type care for employees evidenced by concerns like Rowntree and Pilkington is shown by Marks and Spencer. Yet this humanistic-welfare view, well expressed by Lord Sieff as 'our purpose is to make a profit and serve the community', does not interfere with efficiency. In naval parlance, the M. and S. directors believe that a 'tight' ship is a happy ship.

So efficient is the Marks and Spencer accounting and administrative machinery that the Treasury asked permission to study it. Permission was freely granted. For in all its dealings M. and S. has shown a sturdy patriotism. It is proud of the fact that in 1962 Lord Marks was given the Tobe Award by the United States as the outstanding retailer – the first time the award has gone outside America. Proud as it is of its remarkable record of annual sales totalling over £600 million in 1973–4, the firm is proudest of all of the fact, blazoned on the front of its shop windows, that '99 per cent of Marks and Spencer products are made in Britain'.

The accent on quality is very notable in many spheres of British industry. There are innumerable illustrations of it.

For instance, Liddell, a fair-sized Irish linen manufacturer near Belfast, dispatched a consignment of shirts and hotel table linen to Argentina in September 1939. The ship carrying the consignment was sunk off the Thames Estuary by enemy action. Six years later the vessel was salvaged and its cargo resumed its journey. The Argentinians delightedly reported that the linen was in superb condition. Which explains why Liddell's supply most of the table linen for the top London hotels as well as for many overseas, including leading hotels of the American Hilton and Intercontinental groups.

What Marks and Spencer have done with remarkable success is to marry quality to highly geared mass production techniques which have erased class-barriers. It is a matter of pride for women in the upper income bracket to say, 'I got this little thing [dress, jumper, blouse] at Marks and Sparks'. Their husbands are probably pointing out at the same time that their shirts are purchased in the same place. This explains why 10 per cent of all clothing bought in the United Kingdom comes from M. and S. In the case of knitwear the figure is 20 per cent. For underwear it rises as high as 40 per cent. Today each Marks and Spencer store turns over some £2 million per annum compared with a total income for the group of just £1,306,000 when the firm launched its own-label policy in 1928. Profit at £76 million is some 12½ per cent of today's £600 million plus turnover, a very substantial sum indeed and one that in times past would have raised the cry 'Profiteering'. That it does not do so is in no small measure due to the acknowledged fact that Marks's 30,000 staff (10 per cent of whom have been with the firm for twenty-five years or more) are well cared for and Marks's 30 million customers get value for money.

It is through service and responsibility as much as through higher living standards stimulated by competition that modern capitalism has overcome the prophets of woe who forecast its downfall. Before leaving the field of retailing in

which the British genius for shopkeeping still exerts itself we shall examine another British institution which has gone round the world, one which initially claimed to serve the community *without* making a profit: the Co-operative movement.

The Rochdale pioneers were a small group of Lancashire weavers, some twenty-eight in number, who decided to form a trading co-operative in 1844. According to G. D. H. Cole, historian of the movement, retail co-operative ventures had been tried half a century and more before the Rochdale pioneers launched theirs. What distinguished the Lancashire weavers' operation from those elsewhere was that it codified the system and put it on a business basis which would ensure its continuation.

In the early nineteenth century workers were often required to buy their goods from a company-owned store either because it was the only shop in the neighbourhood or because the employees' wages were paid partly in vouchers exchangeable for food, clothes or housing utensils as the company shop – the truck method of payment. Not unnaturally the workers concluded that they would do a lot better by buying in quantity and keeping the surplus for themselves, with enough put back into the concern to trade continuously and gradually extend activities The theory behind the retail co-operative and the production co-operative as well sprang from the visionary Robert Owen He believed that if only people would get together the problems of the world would dissolve. As a philosophy it had much attraction. Unhappily when it was put into practice it was the philosophy, not the problems, which dissolved. However, Robert Owen was also an able business man and within a strictly limited framework his ideas were not beyond realization It was in this realistic spirit that the Lancashire weavers approached their task.

They flourished. Other co-operative societies sprang up and within a generation there was a co-operative union covering the whole country. Other nations adopted the system, successfully on the Continent and in Russia, with much less

success in the Americas, and by the close of the nineteenth century it seemed set fair to rival and outdo conventional free enterprise trading.

The Co-op principle was simple. A small payment, perhaps one shilling, secured membership. One then became a shareholder entitled to a dividend on the amount purchased during the year. At the end of the accounting period the dividends were distributed. The members were the owners. They elected a board of directors which appointed managers to the stores who, in time, recruited staff. Gradually the principle of the 'Co-op' was extended. Wholesale societies in England and Scotland acted as bulk suppliers to all the retail societies Factories were established and orchards and farms purchased to supply the wholesale agencies with produce, mainly food but a certain amount of clothing and other goods. A Co-operative building society was set up (this later split from the movement, retaining only the name and operating in exactly the same way as other building societies) and a co-operative insurance organization was formed. There seemed nothing that would not yield to the Co-op solution: from agriculture to hospital treatment, from food to footwear, from housing to holidays in Co-op hotels and boarding-houses.

Traditional traders looked upon the Co-op with a considerable degree of hostility. A very contentious issue was that the dividend did not rate for taxation. It was regarded by the Inland Revenue as a trading discount rather than as income. This, said independent retailers, gave the Co-op an unfair advantage. Finally a parliamentary committee under Mr Neville Chamberlain ruled that while 'the divi' could rank tax-free if distributed, that portion of it retained to finance expansion should be subject to tax in the ordinary manner. The free enterprise trades were mollified.

Before this happened, however, the Co-op had taken a step of far-reaching importance. In 1919, irked by what many of the movement's leading personalities regarded as war-profiteering in the private sphere and aflame with the

revolutionary zeal which had taken hold of Russia, the Co-op resolved to 'go political'. It made an alliance with the Labour Party, a pact ultimately widened to embrace the Trades Union Congress in a great Council of Labour.

The Co-op agreed to nominate and finance the election of Members of Parliament under the Labour banner In 1945 twenty-one of the Labour MPs in Attlee's administration were Co-op sponsored. With more than 11 million members in the Co-op and 10 million in the trades unions affiliated to Labour; with the retail service trades increasingly coming under the control of Co-operatives; with nationalization taking over the basic industries—coal, electricity, gas, transport, steel; with an apparently monolithic political movement representing the interest of exultant labour, the outside observer in the forties would have been excused if he had concluded that Britain was well on the way to the complete socialist state. But he would have been wrong. For the British capacity *not* to push things to their apparently logical conclusion proved itself yet again. Instead of a socialist revolution there was a consumer revolution. Capitalism saved itself by its adaptability and, in the flood of washing-machines, refrigerators, vacuum-cleaners, motor-cars, package holiday tours abroad that was unleashed from the mid-fifties on, the Co-op fell further and further behind. The political link became a positive embarrassment to both the Labour Party and to those business-minded members of the Co-op.

Happily for the movement the Co-operators, for all that the name implies, are an independent lot. They cling stubbornly to their locality despite the strong economic argument for merging. So the local Co-ops gradually took on the coloration of the district in which they operated. They modernized their premises; they appointed talented business chiefs—regardless of their political persuasions – at the head of the wholesale societies. They paid them according to their market worth and not what the Rochdale pioneers might have thought appropriate. The political links with Labour, though still in existence, became more tenuous; the effort to

'sell' the Co-op as a going commercial, competitive concern became stronger.

In its advertising the Co-op had always shown a refreshing freedom from political prejudice. It advertised a great deal in the newspapers which year in, year out campaigned against the Co-op's methods and its 'unfair' rivalry to small shopkeepers. The Co-op was more concerned with appealing to the millions of potential customers than with the fact that the newspapers' political views were diametrically opposed to those for which the Co-op was supposed to stand. This ability to compromise, to push theory aside when practical considerations apply, is a very British characteristic. It is an instinct which has earned the country the opprobrium of foreigners who talk bitterly of 'Perfidious Albion'. Yet it is this instinct which again and again saves Britain from those extremes which plague less favoured lands.

The Co-op's idealism has not wholly deserted it even though trading stamps have largely replaced the 'divi'. For the Co-operative movement is still an association of 15 million members trading for their mutual benefit.

The Co-op is now like other big groups, bearing closest resemblance perhaps to the voluntary partnerships of its once fearful rivals, the small traders. Yet if the Co-op had not been developed a great number of people would have remained convinced they were being exploited by greedy private traders. The Co-op introduced *an effective alternative.* It helped to remedy the genuine grievances of the truck-ing system, and it also demonstrated that there was no magic way of selling meat or bread or shoes or furniture without a margin of profit for the retailer. Its competition has helped to make the private traders more efficient and thereby enhanced the free enterprise sector of the economy.

Chapter 19

VOICE OF CONSCIENCE: BBC RADIO

'The medium is the message' is how the Canadian philosopher of communication, Marshall McLuhan, has summed up the importance attached to the means of transmitting information, explanation and opinion to the masses. The treatment of news is of as great a significance as the news itself in producing a reaction among those watching, reading or listening to it. It follows that those handling news and comment are in positions of power, greater today than at any other time in history.

In its approach to this problem Britain has evolved a unique system of public enterprise: the British Broadcasting Corporation. One man moulded it, gave it breadth, vision, spirit and purpose John Reith (later Lord Reith). Enormously tall, beetle-browed, formidable in appearance as a Victorian headmaster, John Reith, who died in 1971, was a son of the Manse. His father was a minister in the Church of Scotland. To understand the BBC it is necessary to grasp the character of the man who turned it from a collection of disparate interests with a dubious future into the most remarkable example of public service broadcasting ever known.

Reith was that Scottish phenomenon, the 'lad o' pairts', able to tackle jobs with a degree of concentration and energy which perhaps no other race can emulate. It is altogether a very different quality from the effortless superiority which is supposed to be hallmark of the English public school product. Many strands went to forming Reith's character: a passionate concern for learning; deep religious feeling; a resolve to widen the horizons of others; a stubborn integrity which would brook no intimidation and precious little opposition; remarkable physical strength and courage; a prudent

care for his own and the country's money; and finally a bristling stubbornness best described by the Scots term 'thrawn', which made him a difficult subordinate and no doubt an uneasy colleague. In short, John Reith was the Lowland Scot writ large: the material which tamed nature, conjured up vast businesses, built empires.

Reith might have been one of many things: distinguished divine, academic, politician, business man or soldier. Indeed it was as a soldier in World War I that the public personality was shaped which was later to be impressed upon the BBC. When he arrived in France early in 1915 as a young lieutenant with a draft there was no one to meet them, so he asked directions of a dockworker at Dieppe: 'Nous désirons arriver à la guerre, nous serons en retard.'

He arrived at his war soon enough and was grievously wounded in the head. What he felt he recounts in his book *Wearing Spurs*: [1]

> I was tired and wanted to look up at the sky again. The opening lines of a children's hymn came to mind:
>
> Above the clear blue sky,
> In heaven's bright abode...
>
> Well very soon now the supreme mystery would be solved, I was completely content and at peace. All was well...

The sang-froid at approaching death is explained in Reith's case not by a jaunty disregard for the fates but by a fundamental faith in Christianity, in 'heaven's bright abode'. This Christian conviction was carried into his work in the BBC and was erected as the cornerstone of the new organization. Not that John Reith's religion was all from the New Testament. He could call on the vengeful God of Old when the mood took him.

The Calvinistic conscience would not be denied. Nor would a cool assessment of efficiency.

1. Hutchinson, 1966.

Efficiency [said Lord Reith] is primarily an engineering or commercial term. It implies that a machine does its work to a certain standard, that a bridge carries its load with a reasonable factor of safety, that in an elementary way, the value and the performance of the product are commensurate with the cost of making it.

What disgusted Reith about war was the *waste* of human life and resources. As one who had miraculously survived the holocaust, Reith felt an obligation of service to the community. He found his purpose in broadcasting. For thirteen years, from 1925 until shortly before the outbreak of the Second World War, he commanded – that is the only proper word – the BBC, first as general manager of the Broadcasting Company then as Director General of the British Broadcasting Corporation, set up by Act of Parliament. It needed a strong man of quite exceptional integrity with a dash of fanaticism and a fairly deep streak of ruthlessness to push through the concept of public service broadcasting against confusion, conflicting aims and the not unjustifiable distrust of letting the State be the paymaster: for all licence fees are of course collected by the Post Office.

John Reith was in no doubt what was wanted. He also had the will.

Without the brute force of monopoly [he said] many things might not have been done that were done. The Christian religion and the Sabbath might not have had the place and protection they had; the place and protection which it was right to give them, the giving of which seemed to be approved.

There would have been less persistent transmission of good music, of good things in every line. School Broadcasting initiated, urged, developed, financed by the BBC, with rather negative and timid help from the authorities, might not have been essayed. Almost everything might have been different; the BBC might have had to play for safety; prosecute the obviously popular lines; count its clients; study and meet its reactions; curry favour; sub-

ordinate itself to the vote . . . its road would have been far harder.

Reith[2] conceded that the normal expansion of broadcasting in simple competitive commercial terms would have produced plenty of benefits: education, information, company for the elderly, the sick and the lonely, carrying the amenities of town entertainment to the countryside, bringing mighty issues and notable voices to the hearthside. But for Reith that was not enough. He wanted the BBC to project 'the best'. It was of course conceit (a virtue, or vice, in which the Scots have never been lacking). It was also tremendously effective in building a source of authority free of commercial pressures and free alike of unfair pressures from Government.

This latter feature was soon put to the test. Within months of the establishment of comprehensive broadcasting the General Strike began. There were no newspapers, except the *British Gazette* for the Government and the *British Worker* for the strikers, which appeared after three days of the nine days of general stoppage. Broadcasting was the prime source of news. Reith recalls:

> Throughout the period [May 1926] I vetted almost every item of every bulletin myself. It was made clear that, although the civil commissioners (regional controllers armed with exceptional powers over food supplies, maintenance of law and order, etc.) or departments might ask for this or that to be broadcast, the decision rested with the BBC. I had talked with the Home Secretary, Joynson-Hicks, and with the Postmaster-General. They had agreed that the BBC should not be commandeered, and that it should have a considerable measure of independence. This was not at all satisfactory to the Chancellor of the Exchequer, Winston Churchill. He demanded that the BBC should be immediately commandeered.

Churchill relished a fight. He also believed that if you

2. *Into the Wind.* Hodder & Stoughton, 1949.

were in one you fought with all the weapons you could lay hands on; hence his resolve to make the BBC the spokesman for Government views. There was also a clash of temperament between the ebullient, good-living Winston, the Cavalier, and the stern, unyielding Puritan defender of impartiality, John Reith.

On this occasion, however, the final word did not lie with Churchill but with the Prime Minister, Stanley Baldwin. Reith went to the Chief and eventually got his way. Together with Baldwin's close friend and Parliamentary Private Secretary, J. C. C. (later Lord) Davidson, they prepared a memorandum which concisely expounds the gist of the Charter and distils the philosophy guiding a State-owned broadcasting service in a democracy.

> The BBC has secured and holds the goodwill and affection of the people. It has been trusted to do the right thing at all times. Its influence is widespread It is a national institution and a national asset. If it be manipulated, the immediate purpose of such action is not only unserved, but prejudiced. Even if the people could be doped the hostile would be made more hostile from resentment As to suppression, from the panic of ignorance comes far greater danger than from the knowledge of facts.

These guidelines reflected the BBC's organization and framework of reference. As Reith explained:

> The governors of the BBC act primarily as trustees to safeguard the broadcasting service in the national interest. Their responsibilities are general and not particular. They are not divided up for the purpose of departmental supervision. The suggestion sometimes made that governors should be appointed as experts or specialists in any of the activities covered by the broadcasting service is not regarded as desirable.
>
> The governors should as far as possible be persons of wide outlook and considerable experience of men and affairs, preferably with previous experience of public ser-

vice of some kind or another; and there should be included also a person or persons with financial and commercial experience.

As it was in Reith's day so it is today The governors are subject to the Minister of Posts and Telecommunications (the responsibility was transferred to the Home Office by the 1974 Labour Government), whose job in its broadcasting context is to make sure that the will of Parliament and Crown expressed in the Royal Charter, duly renewed from time to time, is carried out. Where a very big difference from the Reith era may be observed is in the respective powers of the chairman of governors and the director-general, the permanent head of the service. Reith reckoned: 'with the director-general the governers discuss and decide on major matters of policy and finance, but they leave the execution of that policy and the general administration of the service in all its branches, to the director-general and his competent officers.'

It will later be shown that the authority of the director-general has been considerably curbed as the dilemma between responsibility and freedom of comment has become more acute. In Reith's day there was no such complexity. He was the boss and when, in search of new fields to conquer, he left the Corporation in 1938 it was the Reithian BBC that went to war. Never before or since has a broadcasting service exerted such astonishing influence as did the BBC in the years 1939–45. 'This is London', the 'V' sign in morse, the voice of Churchill, gave hope to millions upon millions in conquered Europe and to not a few Germans who longed for the overthrow of Hitler's Reich. The BBC exerted this immense authority because in large measure it reflected the integrity and standards of the man who had moulded it It *was* righteous, occasionally self-righteous, but it was representative of all that was decent and upright in a world steeped in the slime of Belsen and Buchenwald.

Not that the Corporation was the only weapon in the British armoury of words. In the shadows and of course out-

side the jurisdiction of the BBC lay the Black Radio which poured virulent, scabrous and brutally effective propaganda into the heart of Nazi Germany. Stories were told by Germans (or by Britons with impeccable German accents) giving scandalous accounts in the most intimate detail of the lives of leading Nazis. These tales were broadcast from a station calling itself 'Soldatensender Calais' on a wavelength that made it appear to be coming from inside German-occupied Europe.[3] The reports were made by British journalists led by the head of the service, Sefton Delmer, or by refugees from Nazism, based on information supplied by agents, spies and traitors in the German forces.

So pervasive was the influence of British propaganda - Hitler had paid it an outstanding compliment for its effect in the First World War—that the Germans began to believe that British agents were everywhere. Walter Schellenberg, high up in the hierarchy of German Intelligence, actually convinced himself that even the Boy Scout movement, founded by Baden-Powell, was an arm of the British Secret Service.

It is well to recall that Britain did not start the propaganda offensive—'offensive' in both meanings of the word. The Germans did that long before the war began. They sowed the wind and reaped the whirlwind. What the story of the Black Radio does do is to illustrate the capacity of the British to strike back when they are really roused. The fury of patient men is shown by the history of this organization.

It is to the credit of British broadcasting that the venture did not corrupt standards when peace returned. 'In war Resolution', 'In defeat Defiance', 'In victory Magnanimity', 'In peace Goodwill' Churchill's watchwords exactly reflect the British character. With hostilities at an end, the BBC reverted to its high degree of impartiality, buttressed with enormously enhanced prestige.

3. For the full story of this enterprise see Sefton Delmer, *Black Boomerang*. Secker & Warburg, 1962.

Chapter 20

FREEDOM AND RESPONSIBILITY: TELEVISION

Television, the product of Scottish-born John Logie Baird, was first used as a medium for entertainment and enlightenment by the BBC in 1936. It grew satisfactorily until the onset of war put it out of action. It was not until the early fifties that television became the major mass means of communication.

The BBC had a monopoly and the Reithian influence was paramount until the birth of commercial television in 1955. Its birth was preceded by anguished labour pains. Most people in what could be called the 'intellectual establishment' deplored and denounced the innovation. Commercialism, they claimed, would prostitute an art form and turn a public service into a money-making spree for financiers. Standards would be debased to appeal to the lowest common factor. The sense of being an educator would be lost in the hectic pursuit of ratings and profit.

Promoting the campaign for commercial television was the Popular Television committee, strongly represented in the Conservative Party, which was then in power. It contended that the BBC monopoly was not responsive to changing public tastes; that monopoly was no longer tolerable; that commercial—or as they preferred to call it, 'independent'—television would provide the necessary stimulus to sharpen and improve the Corporation's programmes; and, finally, that independent television would cost the viewer nothing (an annual licence fee financed the Corporation) since advertising would meet all the costs.

The climate of opinion was favourable to the competitive argument. The advertising interests were powerfully persuasive in arguing their case and the Conservatives were philosophically inclined towards free enterprise. There was,

however, one nagging doubt. Would advertising dictate the programmes, as in America? If Krunchy Krumpets wanted a mass audience to advertise its products to it would sponsor shows appealing to the majority. Culture, education, minority interests, it was said, would be swept away in a flood of triviality.

Once again the British genius for compromise exerted itself. To avoid the hazards of sponsorship, the direction of the new service was put into the hands of an authority established by Parliament but paid for by the contractors, i.e. the companies who put out the programmes The Independent Television Authority would lay down standards governing content and advertising. The contractors would sell time to industrial companies who wished to advertise their products on the screen, but the advertisers themselves would have no control over the programmes. They would simply buy time as they bought space in newspapers.

In this way commercial television was launched and so, with a number of amendments, including a levy to cream off excess profits, it continued. To sustain regional interests and prevent the growth of commercial monoliths the country was split up into areas and contracts awarded for each one. So diversity, competition and responsibility were all served.

However, the effect on the BBC was traumatic. No longer, it was felt, could the 'old', rather stuffy, austere, conventional methods be maintained. The Corporation must be 'with it' both to compete with the brash newcomer and, more fundamentally, to reflect the dramatic changes of the new age. For it happened that at the very moment commercial television entered the scene the post-war mood, really a continuation of the forties, underwent an incredible alteration. The affluent young, reared on full employment, broke through the restraints and deference accepted as natural by their elders and took the entertainment world by storm. Within a very few years the BBC, bastion of the traditional, was in the forefront of the permissive revolt.

Retreat from Empire signalled a rejection of many traditional values and was reinforced by a cultural distaste with

the past illustrated by the Angry Young Man school of dramatists and authors.[1] In this literary fashion England led the way. And to the amazement of the rest of the world the BBC marched to the van of the movement.

In a sense it was uniquely qualified to do so. For alone among the broadcasting services it was neither dominated by the State, as in France and Russia, nor commercially controlled as in the United States. It was that typically British development, a hybrid. And when a strong-willed man took over the director-general's chair in 1961 dramatic changes followed as remarkable, albeit in a different direction, as those that had taken place with the rise of John Reith.

The new man was Hugh (later Sir Hugh) Carleton Greene, brother of author Graham Greene. Carleton Greene had been a journalist with the *Daily Telegraph* and had collaborated with Sefton Delmer in the war-time foray of Black Radio. This experience had steeped him in unorthodoxy and he exhibited it when he took over at the BBC. Safety went out. Experiment, youth and boldness came in. Playwrights were commissioned to write plays which would have been considered daring for advanced theatre. Discussion programmes became far freer as subjects previously considered 'taboo' were given the all-clear. But most sensational of all was the decision in autumn 1962 to launch a satire show, 'That Was The Week That Was', introduced and compèred by a twenty-three year old Cambridge University graduate, David Frost. Practically every person connected with the show in front of the floodlights or behind the cameras was in his early twenties. The image of 'auntie BBC' was shattered into a thousand fragments.

Where John Reith used 'brute monopoly' to sustain the Christian message, Hugh Carleton Greene deliberately opened the studios to discussion on humanism. Where John Reith imposed stern standards of dress and behaviour on his staff, Greene encouraged a relaxed atmosphere. Where John Reith demanded impartiality to the point of impassivity in the voices of his announcers, Greene allowed freedom of

1. See pages 438 ff.

expression to a quite extraordinary degree, magnified of course by the fact that the audience saw the expressions as well as heard the intonation of the newscasters.

Here was no matter of flinging wide the casements to let the fresh air of liberal thought flow through the corridors. The window-panes were taken out. The cleansing winds became a gale. Inevitably there was criticism. After three years 'That Was The Week' and its successor programmes were abandoned. Finally Greene himself was eased out of his all-powerful position by the appointment of Lord Hill as chairman of the governors, a post he made clear from the start he intended to use as no chairman before him ever had. The Greene era was ended. The consequences redound to this day.

Arguments about 'permissiveness' and 'puritanism' are out of place in this work. It is simply true that the BBC, which had built a reputation for strong morality and was everywhere respected if not loved, now acted as the pacesetter for free expression. The service attracted foreigners from many lands, notably America, where different standards prevailed. 'Swinging London' was a phrase coined by the slick writers of *Time*, the American magazine. And the BBC gave London an extra whirl.

It is fair to say that Carleton Greene's reign at the BBC gave new dramatists, producers and current affairs pundits a chance to project their talents which they would have got nowhere else. The questioning of public figures—Ministers, MPs, company chairmen—became much sharper and more penetrating. One or two reputations were utterly broken by the new breed of interrogators. Yet so potent was the appeal of the television screen on both channels that it was a rare event for anyone to refuse to appear. Even a man accused of fraud, Emil Savundra, allowed himself to be questioned fiercely and aggressively by David Frost. Frost was himself accused of conducting a trial by television. Such is the Briton's innate sense of justice that this practice was immediately discontinued. However, as is the way with pioneers,

the British discovered the snags and problems of near limitless liberty before their eager imitators.

Censorship is a loaded word. It conjures up thoughts of grim-faced men denying the right of the individual to speak as he will. Yet in truth censorship is exercised every time a newspaper is produced or a television programme put together. It is unavoidable. Some items are included, some are excluded. Every time an editor exercises a value judgment he is in effect 'censoring'. So absolute freedom to advance all views is impossible to attain. What is worrying observers in the United Kingdom and foreign commentators who look to Britain for example is the danger of irresponsible slanting of news, either to make dramatic impact or to promote an individual or 'group' viewpoint. No one can justly charge the BBC with party political bias (although that does not stop members of both parties doing just that). Where prejudice may creep in is where young, radical producers refuse to give credit for honesty of purpose to those with whom they disagree.

This age is above all one of youth. The Corporation, more than any other service in the world, has gone out of its way to serve youth. Has it gone too far? Has that precious gift of balance been put out of true—so that the noisy, the publicity-hunters, the perpetual demonstrators are getting attention far beyond their deserts and their numbers in society? Temptation is strong to play up dissent. The artist has a natural feeling for revolt, for the romantic raising of barricades and the tearing down of conventions. Most of the young men and women in the Corporation have taken Arts degrees, they have not had to cope with the hard realities of running businesses, or making the necessary compromises to keep the system running smoothly. Their impatience is in danger of undermining the very tolerance on which they depend.

Equally, as Charles Curran, the Director-General who succeeded Carleton Greene, remarked: 'You cannot expect the BBC to remain stuck at tea time 1935.' The BBC adapted to change, to the permissive society, and even urged it for-

ward. Can it now take on the ballast which will restore that wonderful balance which is quintessentially British?

Lord Hill of Luton, the former medical practitioner, Radio Doctor, Conservative MP and Postmaster-General, was appointed chairman of the BBC governors by the Labour Prime Minister, Harold Wilson. The common sense of a man who well knows the frailties of his fellows is revealed by observations he made in two publications, *Broadcasting in the Seventies* and *Broadcasting and the Public Mood*.

On news: The BBC's practice of presenting news in as objective way as possible will stand it in good stead . . . we should fill the role envisaged for us by Charles Curran as 'the decent men of international broadcasting'.

On taste: Where programmes are concerned, broadcasters must be constantly alert to changes in public taste and feeling. They must never lose touch with the audience. While striving always to improve the quality of their output they must be wary of rushing ahead.

On society: Television mirrors the society in which it exists. . . . The people who control broadcasting are products of that society and subject to all its pressures and influences. Television, for instance, did not invent the division between the generations. Listen to this: 'We are living in difficult and dangerous times. Youth has no regard for old age, and the wisdom of centuries is looked down upon both as stupidity and foolishness. The young men are indolent and insolent, and the young women are indecent and indecorous in their speech, behaviour and dress.' Those words were used by Peter the Hermit in 1114!

On independence: At all costs and at all times the BBC's independence from governmental and other external pressures must be maintained. We cannot and will not tailor facts to meet the wishes, expressed or implied, of political parties in government or opposition.

On judgment: It is not that we are impartial about everything. We are not impartial about crime or race hatred. The essential point is that we have no editorial policy; no opinion on current affairs. Over a period we are committed to maintaining a political balance.

On balance: The BBC has a definite obligation to the public not wilfully or unnecessarily to depart from a standard of good taste . . . total licence is impossible and the difficulty is to know where to draw the line. Even though we decline the role of moralist we do nevertheless exercise a commanding influence by our acts of selection—selection of script, author, producer, director, actors and actresses.

From being a national spokesman to becoming a national scapegoat seems to betoken a sad decline. Things, however, are not as grim as they appear. Britain, in common with all Western communities, has been through an extraordinary phase of self-questioning. If the Corporation had ignored this country-wide mood, and particularly the scepticism of youth, it would have been accused, with justice, of hiding its head in the sand; of trying to live, in Charles Curran's phrase, in a perpetual tea time of 1935 The Corporation had to move. Whether it moved too fast, whether it gave impetus to change that would not have come from any other source, is a matter for conjecture.

The period of anti-authoritarianism may be passing, in which case the BBC will be able purposefully to restore values which have been held in abeyance as the sixties generation got the anger out of its system. In this healing task the Corporation is well placed to exercise a decisive moderating influence which could set an example to the whole Western world.

Wisdom, restraint and justice are qualities in which the British excel. They do not have a monopoly of these virtues, but they do have them in greater degree than most other nations and it would be false modesty to deny it. Lord Hill has said that his organization mirrors the society in which

it operates. It could also help to lead that society—and others—to a saner, fairer way of looking at things and so live up to the plaque, in Broadcasting House, London, which reads: '*That all things hostile to peace and purity may be banished from this house and that the people inclining their ear to whatsoever things are beautiful and honest and of good report may tread the path of wisdom and uprightness.*'

Chapter 21

THE QUALITY OF LIFE

> The Englishman is no missionary, no conqueror. . . . He carries his English weather in his heart wherever he goes, and it becomes a cool spot in the desert and a steady and sane oracle amongst all the deliriums of mankind. Never since the heroic days of Greece has the world had such a sweet, just, boyish master.

Thus George Santayana's *Soliloquies in England* (1922) on the easy-going hegemony of nineteenth-century Britain in the Orient.

The British Empire then was a projection of Britain's economic strength. The flag more often than not followed trade. But it was also an extension of the British way of life. Relaxed, disciplined—relaxed, that is, in contrast to the iron obedience of Prussia an unspoken code of conduct, an instinctive feeling for justice and order informed British rule throughout the globe. Stuffiness and stubbornness and silliness there were too. And these faults were mercilessly mocked by satirists at home. But in their hearts the foes of Empire must admit that the world is a sorrier place for having lost that great area of stability, decency and toleration that was the British Empire. Most imperial dissolutions in history have been followed by the collapse of society at home or have even been preceded by such a collapse. Nothing like that has happened in Britain. The character of the people has proved stronger than the circumstances The rapid run-down of our overseas commitments, especially after the Suez crisis of 1956, coincided at home with a rapid rise in living standards. But by 1970 the *quality* of life rather than material possessions or international power had become a matter for genuine concern. Britain found herself no longer pitied and

patronized for having shrunk to her original size, but rather admired and envied for possessing a tried and tested society which secured order with liberty; justice with toleration; compassion with individual enterprise. London was now hailed as the haven of civilized standards in a world gone mad with strife.

In a curious sense one of the reputed 'failures' of Britain may turn out to be a blessing and guiding light to others. This is the failure of the economy to grow at the same rattling pace as that achieved by many states. The weekend, the tea-break, the desire to spend increasing wealth in leisure explains, in part, the British slowness. A high regard for old crafts that really aren't crafts any more—the industrial equivalent of the legal fictions and constitutional myths which ease the passage of time—also retards the speed of 'progress'.

For two or three decades this attitude was regarded as entirely wrong. Now critics are less sure. Indeed they are beginning to ask if the British have not yet again stumbled on the right course. Having, so it is said, acquired an empire in a fit of absent-mindedness, having let it go, inadvertently at the precise moment when colonialism could no longer be maintained, have the fortunate islanders once more struck the correct note by caring more for the quality of life than for its pace? 'Environment', 'anti-pollution', 'urban renewal' are the jargon terms of the late twentieth century for what was so much better expressed in the eighteenth, by Burke, as 'the un-bought grace of life'. Edmund Burke forever reminded his countrymen to trust their instinct and to beware of the instant remedies proffered by quack theorists. And again this intuitive sense of balance seems to have worked.

The industrial waste of the steam revolution the disgusting coal-tips, the scum-ridden rivers, the ever-present soot - is being swept away Under Acts of Parliament clean air zones have been introduced and smoke-control orders have been issued to 4,500,000 premises; the coal industry has been ordered to clear up its mess and commercial concerns are

obliged to dispose of their effluent other than by pouring it untreated into the nearest stream.

Much, of course, remains to be done; a growing problem is the discharge of oil off the coast, punishment for which should surely rate a term of years in jail for the ship's master. But a great deal has already been accomplished. London and other major cities are now far cleaner than they have ever been with 50 per cent more winter sunshine than a decade ago. The pall of smoke above them is almost gone. Buildings are being cleaned with the good prospect that they will remain clean. Smog is much less of a problem than it was. By mid 1970 the Thames was cleaner than it had been at any time since the Industrial Revolution, and hopes were rising that fishing in the heart of London would soon be possible again.

Parliament has been the instrument for many of these reforms. But as Max Nicholson, the noted conservationist, points out, the State apparatus in Whitehall has had to be kicked and goaded into action. He pays ready tribute to the voluntary promptings. He was secretary to the Duke of Edinburgh's first Study Conference on the Countryside in 1970. Nicholson observes: 'Among the many constructive results was the agreement that a wider and stronger countryside commission should be developed . . . to oversee and contribute to the maintenance of the amenities of the countryside as a whole.' And that has always been the British way.

In the Greater London Council elections of 1970 a small band of devoted conservationists stood as candidates against the main parties for the cause of 'Homes before Roads'. They were soundly beaten, but they may well be the forerunners of a movement which will halt the increase in the number of cars, restricting them, say, to one per family, and limit the amount of new road-building in order to preserve the amenities of towns and villages.

In this they are following the steps of reforming pioneers of the past. Concern for the quality of life motivated men of high ideals even when the Industrial Revolution was still

advancing, when the phrase 'Where there's muck there's brass' held currency everywhere. Such a reformer was Ebenezer Howard. He published a book, *To-morrow: A Peaceful Path to Real Reform*, in 1898, where he outlined his ideas of better living for the masses without State direction. This was his answer to the overcrowding of Britain's industrial centres. He foresaw complete new cities surrounded by open country and separated from existing towns by a green belt. The Garden City Association was founded in 1899 to promote these aims. Four years later the first garden city, Letchworth, thirty-five miles north of London, was founded, and in 1920 Welwyn Garden City. By 1940 Howard's enthusiasm had caught the attention of Parliament. The Barlow Commission recommended new towns as a way of curbing urban sprawl. In 1944, in the middle of a war for survival, Sir Patrick Abercrombie published his Greater London Plan, proposing that the overblown capital disgorge part of its population to new towns of 60,000–80,000 population, well outside the suburban areas, where speculative booms had resulted in bad development. Two years later a committee under Lord Reith, issued three reports, and statutory approval for the establishment of new towns throughout Great Britain and Northern Ireland followed. By 1970 no fewer than thirty had been built, were building or had been designated, and more than 500,000 people had moved into them.

No other country anywhere has anything like this number of new towns; pioneering examples of modern town planning. Howard's Garden City Association had become the Town and Country Planning Association by the early forties. And here the typical British approach is seen. First the private individual decides to do something about a problem that worries him, in this case appalling housing arising from the concentration of labour in towns to feed the industrial revolution. Having proposed the scheme he gathers like-minded enthusiasts around him, forms his association, which builds a town to show it means business, and then the long, steady pressure is laid upon Parliament to go out and do things on a grander scale.

Here is freedom in action, British style. The urge for reform comes from the grass roots. It is usually opposed, and so its champions have to argue through their case, a salutary and rewarding experience. Many follies are thus avoided. Sufficient politicians having been cajoled, the civil service machinery must be kicked into life. But the point is that it acts as a result of the promptings of the public, or at least a considerable segment of it. The voluntary spirit has put the machine in motion, and volunteers continue to carry it through.

At every stage in British social life there are societies propagating this or preventing that. Sometimes they are quasi-official, i.e. Nature Conservancy; more often they are fully independent, such as the National Trust, an astoundingly successful body which has saved vast areas of Britain from helter-skelter development and opened them up to public enjoyment; a trust for conserving the coasts; trusts for conserving historical buildings and ancient monuments. Sometimes Ministries co-operate, occasionally they are antagonistic. The price of beauty in Britain is eternal vigilance. Happily there are many vigilantes

The efficiency of voluntary services frequently astonishes visitors. The Royal National Life-boat Institution, for example, is sustained by voluntary contributions and is a magnificent service, which the State can only envy. The sensible compassion of the Salvation Army in catering for the down-and-outs, the rejects of society, is unmatched. Meals-on-Wheels for the old and disabled organized by the Women's Royal Voluntary Service is another example One could go on and on about the restless urge to do things outside officialdom.

With the new towns, however, there is a partnership between central government, local authorities (both those transferring populations and those receiving them), private enterprise and voluntary bodies. This is how the system works. The Minister of Housing, or his equivalent in Scotland, Wales and Ireland, designates an area as development for a new town. A public inquiry is held before a govern-

ment inspector and objections are considered from interested bodies—farmers, amenity associations, householders, etc. These do have effect. At Milton Keynes New Town, Buckinghamshire, for example, the area was reduced by 3,300 acres following local protests. An official project to build a new airport at Stansted was abandoned after a doughty campaign fought by local folk. The same happened at Wing. When they engage the interest and support of the newspapers the chances of the locals beating the Centre are very good indeed.

So the original designation is no mere formality. Assuming permission is granted, however, a development corporation is formed to administer the building of the new town. Membership is composed of people with skills and common sense—a business man, a building society chief, an engineer, an academic, an accountant. They are part-time public servants who receive a small honorarium, except for the full-time chairman and deputy chairman.

The corporation prepares a master plan showing location of industrial, residential and service areas, recreation parks, amenities and transport systems These plans are submitted to the Minister, who has further discussions with local interested parties and, possibly after modifications, approves the scheme. Land may now be purchased or compulsorily acquired at market rates for building. Consultants plan the houses and corporation staff—engineers, architects, finance officers—carry out their allotted tasks. All along the line local bodies are associated with the venture to keep discordance to a minimum and to promote participation. When the population of a new town has reached its target figure, say 100,000, the development corporation hands over to a commission whose members are appointed by the Ministry and which exercises transitory powers until a fully elected council takes over.

Architecture in the new town reflects the character of the country. People want gardens because gardening is in the blood of most Englishmen (*not* Scotsmen). As a result most new town corporations reserve only 10 per cent of living

accommodation for flats. In view of this preference houses are provided in varying styles to avoid monotony and ensure privacy. They are built in courts, or closes, or terraces and landscaped with shrubs and trees, and different materials and colours are employed to infuse diversity.

Much has been learned from early days. Part of East Kilbride in Scotland, one of the first new towns, wears a forbidding appearance because far too great an area was built in blocks, like barracks. Later projects, notably Cumbernauld, also in Scotland, which has won an international architectural prize, have avoided these blunders. There is today almost as high a degree of variety between the style of the new towns of Stevenage and Glenrothes as there is between the old towns of Ipswich and Stirling.

Of the 200,000 houses so far built half are available for home ownership. This proportion is likely to rise rapidly as Britain moves to a genuine property-owning democracy In addition private non-profit-making associations build homes for their members, who run their own affairs within the new town framework. Elderly people are catered for in bungalows and ground-floor flats near their children so that family life is strengthened—a lesson learned from early mistakes in which new towns catered almost exclusively for young marrieds so that there was no population balance. Allocating 15 per cent of accommodation to the grandparents is one way of building a true community Another is to ensure that there is sufficient local industry to counter the magnet of the nearest city.

Paralleling the development of new towns has been the deliberate policy of guiding industries into certain areas. This started in the thirties with the establishment of the Hillington industrial estate near Glasgow. It gained momentum in the forties, and today a whole armoury of inducements exist to tempt firms to spread employment. These range from investment allowances and the provision of advanced factories and cheap rents to industrial certificates which may be withheld from firms who build in areas where there is already a shortage of labour.

New towns have also provided opportunities for trying out all kinds of experiments in traffic segregation, education and social services which could not easily be grafted onto older communities. In Cumbernauld none of the main traffic roads have footpaths Segregation has gone further here than anywhere else in Britain, which doubtless explains Cumbernauld's enviable reputation of having only one-quarter the accident rate of the rest of Britain. A bigger investment in public transport as an acceptable substitute for the private car is also part of the new town philosophy. The official view is that it is useless to devise a structure for a city on the basis that nearly all journeys will be made by car if this demands an investment in highways so large that there is neither the land nor the money to provide it.[1] Convinced that mobility ought not to take precedence over environment many of the new town councils have been reserving rapid transit roads for buses and building bus-stops at intervals of 500 yards. This is proving highly satisfactory.

In the social services too there is experiment. The idea of giving everything 'free' is changing to one of encouraging people to help themselves. The philanthropic Nuffield Provincial Hospital Trust finances six health centres at Harlow. It is significant that the Nuffield Trust also operates a pay-as-you-go private health insurance scheme, the British United Provident Association, giving effect to 'market choice' in health services Here again, the refusal of the British to accept rigid doctrines is seen to advantage.

Above all, a new community takes roots because the people determine their own future. They set up their local football teams, Rotary Clubs, Women's Royal Voluntary Service, Civic Trust (to oversee design and make sure that rubbishy developments are prevented), drama groups and so on. Paternalism has its place in the growth of new towns—the pioneers, remember, were Victorian paternalists—but in the end it is the individual acting with other individuals in a free society who decides how things will go.

1. *Public Transport and Traffic.* Command Paper 3481, HMSO, 1967.

Britain is the first truly post-Industrial Revolution society. Between 1800 and 1900 the proportion of her population living in large towns rose from 20 to 80 per cent. By the mid twentieth century her farming population had fallen to little more than 3 per cent; only half the proportion in the United States. The British genius for compromise, for steering well away from blind doctrines, for mixing State guidance with individual enterprise, has, on the whole, paid off handsomely.

Nowhere is this seen to better advantage than in education. For a host of historical reasons Britain has a remarkable diversity of schools. The great bulk of pupils attend the State system and there is a wide range. Many primary schools are Church foundations and put more emphasis on religious instruction than the purely State-supported ones. In Scotland and Northern Ireland the Roman Catholic minority insists on segregated education.

At the secondary level variety is still more pronounced. Local authorities are given a considerable degree of freedom to decide how to operate the system to suit local needs. There are grammar schools for the more academically gifted, technical schools for those of more restricted interests and secondary moderns for the intellectually less well endowed. Since 1945 England has embarked on comprehensive education—Scotland embarked on the system well before that date—whereby all pupils in a neighbourhood are grouped into the same school, thereby dispensing with the qualifying examination normally taken at eleven-plus. The theory behind this development is that greater social cohesion is obtained by avoiding separation and that a single large establishment can afford to offer a wider range of courses and facilities than would be possible in three different smaller institutions.

Much argument has raged over this project, the Conservative Party broadly supporting the selective method and Labour the comprehensive solution. The very uniformity of the comprehensive is a factor militating against its adoption in all areas because each county council is resolved to tackle its education programme in its own way. It is safe to

conclude that discussions and differences will continue for a long time.

Outside the State system is a private sphere which covers the whole spectrum of schooling from the nursery to the eighteen-plus group. In addition to full-fee-paying schools, preparatory and public, there are grant-aided and direct-grant schools. These are establishments, usually of outstanding achievement and ancient lineage, to which local councils and/or the Exchequer contribute, in return for which places are reserved for scholarship winners, whose fees are paid by the authorities. The purpose of this is to offer first-class education to able children whose parents have slender means.

Here again there are disputes about the morality of this course, but it is broadly acceptable to a country which believes in variety and can see the point of having establishments which act as pace-setters It is a case of quality versus equality, and while striving for a higher degree of the latter the British are the last people to demand a clear-cut decision, preferring always to soften issues and determined not to throw away the good in a system, however illogical, merely to get a neat, tidy answer.

With the universities and technological colleges there is a similar degree of unevenness. Oxford, Cambridge and the four ancient Scottish foundations of St Andrews, Glasgow, Edinburgh and Aberdeen represent the old idea In the mid nineteenth century matching the growth of public schools was the expansion of universities to bring advanced education to the expanding middle classes. In the post-1945 period there has been a further surge, leading to the creation of new universities, and the transformation of a number of technical colleges into institutes of higher technology and science.

This swift expansion was in response to the fears expressed by the Robbins Committee on higher education and other distinguished bodies that the reason for the United Kingdom's indifferent economic performance was a shortage of skilled man- and woman-power. New universities were called into existence to redress the balance, which it was felt was

tilted too heavily in favour of the arts and learned professions.

It seems indisputable that the process was too rapid; the desire for 'instant solutions', so typical of Western societies in the past twenty years, led to the creation of universities so that politicians could turn round and say 'see how well we've done'. More does not always mean worse, but the general academic standing of the new establishments has not been as high as it would have been had things not been forced.

Inevitably the sudden influx of students and the recruitment of staff, not always of the best quality, led to stresses and strains in the universities which were exacerbated by the student unrest general to the Western world. Where the universities were more closely identified with local communities, for example, those that sprang up in the cities of Liverpool, Birmingham, Southampton, etc., dissent was in a fairly minor key as it was in the collegiate universities of Oxford and Cambridge where faculty and student are close together. Scotland was still less affected because the universities had never been regarded as privileged abodes and a 'chip-on-the-shoulder' attitude was considered both silly and pointless. The protest movement was strongest in places like the London School of Economics with its high proportion of overseas students – close on two-thirds of post-graduates, for example, plus its proximity to Fleet Street and a major television centre to ensure immediate publicity; and in avant-garde institutions like Sussex and Essex, with their emphasis on social studies. Here again the proportion of foreign students, particularly Americans, taking part in the demonstrations suggested that the extreme radicalism was not a native pursuit. But as the sixties gave way to the seventies it appeared that the wave of rage had passed its peak.

Donne said, 'No man is an island.' The same is true of nations. What happens to Britain's neighbours must affect Britain. This has been true of the student protest movement, of the remarkable spread of pop music, of the 'advertisement culture' of the twentieth century and other social phenomena.

Yet there is a British peculiarity which changes or softens or at any rate in some way modifies these world-wide pressures. It will be no meagre subscription to a better tomorrow if Britain can transmit that calm instinct for decency to less favoured lands.

Chapter 22

THE INVENTIVE BRITISH

'I think the whole world will agree that as a nation this country has been second to none in the production of new ideas and new inventions. But in the past we have sometimes been slow to put these ideas to full use, or even occasionally neglectful of them altogether, often with very grave results.' Harold Wilson, President of the Board of Trade, House of Commons, June 1948.

'I say most seriously that the road to Carey Street is paved with good inventions.' Oliver Lyttelton (Lord Chandos) former President of the Board of Trade, House of Commons, June 1948.

The British are most certainly an inventive race. A glance at the list of over sixty major British inventions in the appendix will confirm this.

This small, geographically insignificant island off the European mainland is where the modern age began—with the Industrial Revolution of the eighteenth and nineteenth centuries. Britain had all the necessary ingredients to become the world's first workshop. Steam power—she invented it. Coal—plenty of it. She had capital accumulation—Britain had early financial expertise as a trading and commercial centre. She had respect for the application of science. The modern scientific method was in effect invented in the 17th century by Sir Francis Bacon who tired of the arid disputations of contemporaries. (How many angels can stand on a pin head?). The job of science he argued was to search for truth (i.e. for verifiable information) and to benefit people. In 1660 the Royal Society was formed to put into practice Bacon's doctrine of the scientific method. Newton was the greatest scientist since Leonardo da Vinci and the greatest

till Einstein. Finally, as we all know, necessity is the mother of invention: the small island could never have supported its fast-growing population without an industrial revolution. Railways and the electric telegraph (both British inventions) revolutionized people's concept of time and space. Though the poor were very poor and lived in the big cities in abysmal conditions (yet often no harder than their forefathers had known as farm labourers), the early Victorian age was one of strident self-confidence. Railways were thrown across the land like a giant spider's web. It was done by the sheer exuberance of the navvy's muscle power, wielding pick and shovel with none of today's sophisticated mechanical aids. Yet it was accomplished in far less time than today's motorway network of very much smaller mileage. At the end of the day the Victorian railway navvy, the élite of the labour force, who sported fancy waistcoats, would clean off his shovel and fry bacon and eggs on it with the heat of the camp fire.

Now look again at the list of inventions and it will be found that from about the middle of the last century, though Britain was still inventing, she was less successful at exploiting these inventions. Invention is often the work of the lone, brilliant individual: the next stage is innovation—the development, tooling and pre-production work, which costs on average some nine times the original research and development. Perhaps the backwardness of much Victorian business in accepting innovation was an early sign of the hardening of the economic arteries, the penalty of being first in the field for so long. This meant a heavy investment in plant that was becoming obsolete and therefore a commitment to the status quo as well as a certain arrogance that things were 'all right as they are'. Nor was the scientist so welcome in industry as he was for basic research in the university. It was the beginning of the condition commented on years later in 1948 by Harold Wilson as a thirty-two year old Cabinet Minister.

The Scot James Harrison, inspired by the need to export Australia's super-abundance of meat to England, had invented the refrigerator as early as 1851; but it was the

Americans who exploited refrigeration at the consumer level. Celluloid was a British invention, but it was developed and trade-marked by an American. The motor-cycle and the principle of the modern spray carburettor were invented by the Englishman Edward Butler in 1884, but it was the Germans who exploited both nine years later. The discovery of aniline dyes which was to revolutionize the production of finished textiles was largely the work of William Perkin. He did well from his purple dye and was wealthy enough to retire in 1873 at the age of thirty-five. But it was then the Germans who exploited dyestuffs, so that by 1914 their chemical industry overshadowed Britain's.

In 1904 Professor F. S Kipping of Nottingham University discovered silicones and described their properties in some fifty papers: his findings were eagerly seized on by the Americans, who found commercial applications in the field of strong glues, water-repellents and insulating agents. The Americans then earned money from patenting the production processes. Similarly Sir Alexander Fleming discovered penicillin in 1928. But it was not available in concentrated form suitable for use on human beings until 1941, and it was not available for mass use until the Americans evolved and patented an effective production process. So Britain, not for the first time, found herself paying heavy royalties overseas for a discovery made first of all in the United Kingdom. A watchmaker and repairer, John Harwood, who patented the self-winding watch in 1923, could find no British firm to make it. He started his own company, but the depression killed it off and the patent was allowed to lapse in 1935. However, Swiss firms inspired by his pioneering work were quick to alight on the advantages of the self-winding watch, which not only helps the forgetful owner but also keeps the mechanism free of dust and dirt that can enter through the winding mechanism. Many of today's self-winding watches still use the Harwood movement.

Not that the picture is by any means a wholly gloomy one. All the major cycling inventions were British and Britain is still the world's major producer and exporter of bicycles.

In the field of textiles, an industry not noted for its inventive genius, there was a major British discovery in the twenties—crease-resisting fabrics. This was fully exploited by its inventors Tootal Broadhurst Lee, a medium-sized Lancashire textile firm, and the effect was felt throughout the textile industry. The technique was to combine resin with textiles. Besides giving cotton crease-resisting properties there was an unexpected bonus: the process greatly strengthened rayon, which is a much weaker fibre than cotton or linen, especially when wet or being laundered.

The invention was remarkable for several reasons. It was the only major one to be conceived and entirely developed inside the textile industry itself at a time of economic depression. Though research and development took fourteen years, till the invention was ready for commercial use in 1932, the company's chairman, Sir Kenneth Lee, never lost faith. He employed only a small group of scientists, who were given the specific goal of developing a crease-proof textile. They were not required to have specialist knowledge of the industry, since fresh minds were required who could 'not have got into ruts'.[1] Success was achieved with a research and development programme costing scores of thousands of pounds rather than the many millions habitually spent by the big chemical firms, even before the war.

Imperial Chemical Industries, of course, has a large research budget and played a prominent role in developing two of the most useful plastics discovered before the war. One was the plastic glass known as Perspex (made under licence as Plexiglass and Lucite in the United States), the other was polyethylene, a material resulting from the polymerization of ethylene. Polymerization is, in effect, the stringing together of molecules of substances somewhat like a chain of paper-clips, to alter and improve their characteristics; it is the process by which plastics, resins and rubber are synthesized. In 1935 ICI scientists were experimenting by subjecting ethylene and carbon monoxide to very high

1. Kenneth Lee, 'Industrial Research: a Business Man's View'. Royal Institution, December 1933.

pressures when a defect in the apparatus caused the pressure to drop. The residue of white powder thus produced had remarkable properties: it could be moulded, formed into a thread or film, was chemically resistant and a good insulator. But development proved difficult: production did not begin in Germany and the United States until 1956 and in Britain in 1960. The old high-pressure technique has now been superseded by a German process.

The British invention of Terylene in 1941 is probably the greatest discovery in synthetic fibres since a young Harvard chemist, Dr Wallace H. Carothers, produced nylon, the first truly synthetic fibre, in 1937. Terylene (first marketed in America in 1950 as Dacron) is tough, resilient and resistant to sunshine and wear. The research team was a small one headed by J. R. Whinfield and J. T. Dickson, who at that time were working for the Calico Printers' Association. Whereas Carothers had abandoned his attempt to make a synthetic fibre from polyester because of its low melting point, Whinfield, a Cambridge chemistry graduate with a passion about fibres, succeeded in finding a polyester with a high melting point which was resistant to decomposition by water. Owing to the war the granting of a patent was delayed until 1946, when Calico Printers gave du Pont in America a licence to make Terylene for the American market. Whinfield and Dickson had discovered Terylene only after much thought backed up by experiment. They worked only part time on the discovery since their firm had little interest in synthetic fibres, and in due course Calico sold their rights to ICI, of which Whinfield later became an employee. In America Dacron was first available in 1950 and in full-scale production in 1953. It was not until 1955 that ICI's Wilton plant opened. Development and capital investment in plant had cost the firm about £20 million compared with the £20,000 yearly budget of the small textile laboratory where Terylene was first invented.[2]

In the field of medical research there was often a reluc-

2 John Jewkes, David Sawers and Richard Stillerman, *The Sources of Invention*. Macmillan, 2nd edn 1969; page 312.

tance to take out patents, on the grounds that new drug discoveries should be available to all: at first sight a wholly admirable sentiment, but one that was to backfire. Thus with penicillin in the 1940s, when a war-torn Britain was also hampered by shortage of plant and manpower, the Americans earned the bulk of royalties by patenting production processes on what was essentially a British discovery. As time passed it came to be realized that patenting was important if a firm was to finance what might be a long and expensive development programme. It was this coupled with Britain's long history of invention followed by non-exploitation that prompted the Attlee Government to set up in 1949 the National Research Development Corporation with a multimillion pound budget in order to encourage, finance, patent and safeguard British inventions, especially those that might not easily obtain commercial backing or that were the product of government departments unable to pursue them. The NRDC can point to some notable triumphs, of which the major British drug cephalosporin is the most spectacular. For an original investment of only about £100,000 the Corporation now reaps an annual reward in licence fees of over £2 million. 'Earnings are still on a rising scale and will last into the early eighties,' says NRDC's Dr James Cain. Cephalosporin which, like penicillin, is initially cultured from moulds, is particularly successful in combating infection of the pulmonary and urinary tracts. It is successful against penicillin-resistant germs and with patients who have an allergy to penicillin. Largely thanks to the 'golden drug' the NRDC made a profit on its operations for the first time in 1968–9 of £48,000 and another profit of £38,000 the following year. Export earnings from Cephalosporin made by British drug firms come to millions a year, and about 5 per cent of all overseas cash sales, even where the drug is made by foreign firms, comes back to Britain in royalties. Cephalosporin has found its biggest market in America, where it is made under licence. In United States hospitals it is the antibiotic of first choice for many infections, and is almost as widely used as penicillin itself.

Most certainly Cockerell's hovercraft would not have been developed in Britain without NRDC funds: the Corporation took over all his patents and has so far invested over £5 million in hovercraft development. This is still by far its biggest single investment, although much of the research and development has been done in conjunction with private firms. Patents in carbon-fibres, the wonder substance used to quadruple the strength of metals and plastics, have also been taken over by NRDC. As Leslie Phillips, one of the inventors of carbon-fibres at the Royal Aircraft Establishment, Farnborough, graphically puts it: 'We were tired of all that bloody nonsense about the British being able to invent but not to exploit. We swore by all the gods that this wouldn't happen to carbon-fibres.' Nor has it.

During its life the NRDC has dealt with a total of 23,000 inventions, which have earned over £15 million. At any one time the Corporation has about 400 projects under its wing, of which almost half are joint projects with industry. 'The Corporation has, as a matter of policy, increasingly involved itself in the support, on a joint venture basis, of innovation and exploitation in industry based on firms' own projects, all market-orientated.'[3] In 1969–70 the NRDC invested a record £5,600,000 in inventions. The range of activities it backs is immense—from oyster hatcheries to the investigation of a substance in bee venom which, if commercially developed, could help millions of arthritis sufferers. One activity of immense potential significance is the research being undertaken by the milling-baking group, Rank Hovis McDougall, for making protein food from carbohydrates. The NRDC has forward commitments of over £12 million, including a stake approaching £5 million spread over three years in the development and manufacture of microcircuitry (the tiny silicon 'chips' used by the computer industry) which is being undertaken by three leading manufacturers, Ferranti, Marconi-Elliott Microelectronics and the Plessey Company. This is one project which it is hoped will ward off the growing micro-might of the Americans. Indeed it was largely

3. NRDC Report, 1969–70.

thanks to the foresight of the NRDC's first managing director, Lord Halsbury, that Britain now has the Western world's only indigenous computer industry outside the United States.

It was a nineteenth-century Englishman, Charles Babbage, who is commonly credited with the idea of the computer. In 1812 he built a mechanical calculating machine which could tabulate to eight decimals; a decade or so later he advanced the principles of an 'analytical engine' in which the entire programme of operations was to be stored on a punched tape. Though Babbage's machine was never finished it was the forerunner of the modern computer. However, the mechanical computer was not much more than a glorified abacus. The crucial breakthrough was the realization that electrons could do the counting far more quickly than any mechanical system. The distinguished English mathematician Alan Turing proposed an electronic calculator as early as 1936 and was responsible for the building of the world's second working computer (the first was at Harvard) soon after the war.

Another notable contributor to the computer was the Professor of Electrical Engineering at Manchester University, Frederic Williams, who had done much work in the war on radar signal storage. A memory store and a device for tapping that store (information retrieval) is, of course, at the heart of a computer, along with the ability to make superfast calculation. The NRDC acquired Williams's computer patents and in the early fifties licences on all of his computer patents were taken out by America's International Business Machines, who were to make good use of his electronic memory brain in the years to come. At the same time many of his patents were also taken up by British firms, and the British computer industry was launched on a highly creditable and by now largely profitable path as the best in the world outside the United States. Early machines used valves which soaked up much power and had formidable overheating problems. Today, thanks to the transistor, developed at the Bell Telephone Laboratories in 1948, it is possible to build into a single silicon chip the size of a full stop many

more components than are found in the average radio set. The transistor in infinitely lighter, smaller and more rugged than the valve and it needs no warm-up time, consequently it has almost entirely superseded the valve.

Francis Bacon's revolutionary fuel-cell, without which the Apollo Moonlanding would have been impossible, is another NRDC-backed invention. Glowing indeed were the tributes of America's spacemen to Bacon, the determined inventor who first hatched his idea for the fuel-cell as long ago as 1932 and then pursued it through a host of setbacks, disappointments and lost jobs for over a quarter of a century. His fuel-cell is a sort of magic battery which generates electricity direct from the oxidation of a fuel. The basic principle is simple; if you pass an electric current through water you get hydrogen and oxygen. Bacon reversed the process by combining hydrogen and oxygen to produce an electric current (the by-product is water). An Apollo spaceship needs a plentiful supply of electrical energy to power all its internal systems, such as air-conditioning, television transmitter, radio and lights. It derives this from three fuel-cells each weighing 240 lb. Had the equivalent amount of power come from a conventional battery it would have weighed ten tons. In addition the fuel-cell provided the astronauts with their drinking-water. Colonel Frank Borman, commander of Apollo 8, which in December 1968 made the first flight that circled the Moon, declared on his subsequent visit to Britain: 'Without fuel-cells, the Apollo programme would not have been possible.' The world's first men on the Moon, Neil Armstrong and Buzz Aldrin, were equally warm in their congratulations when they met Bacon at a reception at No. 10 Downing Street. 'Those fuel-cells behaved perfectly throughout the flight,' said Armstrong. Such was Bacon's great moment of triumph. More than any contemporary inventor, including Whittle of the jet engine, he displayed those qualities of dogged and obstinate persistence which are the hallmark of the truly great pioneer.

Francis 'Tom' Bacon, a descendant of the seventeenth-century philosopher and essayist mentioned earlier, is a

modest, rather mild-mannered, man - tall, thin, bespectacled and utterly dedicated. He was a young scientist-engineer at the Newcastle engineering firm of C. A. Parsons when an article in a technical journal first gave him the idea that it might be possible to make power electrochemically by combining hydrogen and oxygen in something like a fuel-cell —a sort of 'gas battery', that would need no mechanical generation. It took him five years to devise a workable system. Unable to interest C. A. Parsons he converted a bedroom at the top of his house into a primitive laboratory. He also borrowed some tools and experimental time from his employers. They were not amused. In 1940 he was given an ultimatum—either stop working on the cell or leave. He left.[4]

Next he found laboratory space in London, the work being financed by the late Dr Charles Merz, founder of a firm of well-known consulting engineers, but when it became clear that he would not develop an effective fuel-cell before the end of the war he was transferred to the Admiralty, to work on U-boat detection. The fact that so many U-boats were detected when they had to come up at night to recharge their batteries 'made me even more determined to develop the fuel-cell because, with that, endurance would be limited only by the amounts of hydrogen and oxygen that you carried.'[5] At war's end, unable to interest any electrical firms in his idea, Bacon received a grant from the Electrical Research Association to work at Cambridge. He was fortunate in having some family wealth to support his wife and three children. 'If I hadn't been blessed with private means I would have had to give up long ago.'

An important breakthrough was achieved by the use of porous nickel electrodes, which greatly increased the working area of the electrodes; but no sooner was a breakthrough achieved than another snag emerged: after a day or so of continuous operation the electrodes, somewhat like tea-plates swimming in a sea of caustic potash (the electrolyte)

4. Peter Fairley, *Project X—the Exciting Story of British Invention*. Mayflower Books, 1970; page 112.

5. ibid., page 114.

began to buckle and corrode as the temperature in the fuel-cell rose to its optimum of 200° C. (or twice boiling temperature of water). It took a year to beat that problem, but still the electrical industry was suspicious. Understandably so. Bacon's fuel-cell operating at very high pressures (600 lb. per square inch) and rather high temperature and using such volatile fuels as oxygen and hydrogen could be a dangerous power-pack to use. The Electrical Research Association withdrew its grant, but though Bacon was now out of a job he was still utterly determined to go on.

He spent a winter of unemployment and discontent thinking up ways of improving his design—making it bigger and more efficient. Then in the spring of 1956 the NRDC came to his aid by offering to back his invention. Three years later there was a widely acclaimed public demonstration of a prototype cell in which a fork-lift truck and a circular saw powered by fuel-cells were seen in operation. As so often happens a researcher's mistake played a vital part in the next major development. The technician had drained too much water, the result of the hydrogen-oxygen reaction, from the condenser. This increased the concentration of the electrolyte—and the efficiency of the fuel-cell.[6]

An American licence was taken out and in 1962 Pratt & Whitney got the contract to develop a fuel-cell for the Apollo programme. Then, again as so often happens, the Americans poured their multi-millions and the concentrated efforts of over 1,000 technicians into the project, to perfect the fuel-cell for space travel. Among other things they reduced the very high operating pressures to a tenth of the former level. When Neil Armstrong took his first small step on the Moon, Bacon's dogged vision had become part of the giant leap for mankind. Meanwhile Bacon envisages a fuel-cell running on natural gas and is concerning himself deeply with energy-storage problems.

The benefits of the NRDC's work are too generalized to be computed in purely cash terms—there is much incalcula-

6. Fairley, op. cit., page 124.

ble 'spin-off'—but the corporation now securely finances itself, and in decades to come there is every chance that it will play a still bigger role in bridging the gap between invention and commercial success.

Curiously, accident played a key part in another great British invention—Pilkington's float-glass process. This revolutionary technique pioneered by Dr Alastair (now Sir Alastair) Pilkington, a member of the family-controlled Lancashire firm which became a public company at the end of 1970, is now used all over the world. The British patents were sealed in 1957 and today the world's glass industry has invested over £500 million in the Pilkington process—an outstanding tribute to an outstanding British invention.

The Pilkingtons are a powerful and extraordinary family firm with Lord (Harry) Pilkington at the top; half the fourteen-strong board are family members. At first sight they are the sort of autocratic, paternalistic setup more reminiscent of the *Forsyte Saga* than the latter half of the twentieth century. They now bend flexibly to the winds of change in industrial relations after the bitter seven-week industrial strike which racked the company in 1970. 'Pilks', as it is known locally, was started by a Pilkington in 1826 and this was the first really serious industrial trouble since 1845. But there is nothing fuddy-duddy or archaic in the firm's attitude to innovation. Among other things it has a £6 million research centre with 650 scientists, over 200 of them PhDs.

Sir Alastair, three times a Cambridge Blue and an all-England amateur fives champion, got the idea for float glass while he was helping his wife wash up the dishes at home. It is a system of producing glass in a continuous ribbon over a bath of molten metal. The idea came to Sir Alastair as he watched a layer of grease on top of the water in the sink. In the old days glass had been made by two distinct methods. Window glass depended on forming a sheet by stretching a lump of molten glass. This was fairly cheap and produced a hard, fire-polished surface, but the disadvantage was that the glass suffered from distortion, which made it useless for mirrors, car windows or large shop windows. Plate-glass con-

sisted of casting a plate of glass and then grinding it flat and polishing it. Grinding and polishing in themselves were expensive and about 20 per cent of the glass was lost in the process. A somewhat more advanced process produced plate-glass by rolling molten glass from a furnace into a continuous ribbon. It was a move towards automation, but again contact between the surface of the glass and the roller necessitated grinding and polishing to produce flatness. In 1935 Pilkington's developed a continuous twin grinder which could grind and polish both sides of the plate-glass at once. It was a fine example of large-scale precision engineering and gave Britain world leadership in the manufacture of high-quality glass, but it was still one process too many. Then came float-glass, combining the hardness and cheapness of window-glass with the flatness and distortion-free quality of plate-glass.

It is not a piecemeal process; it offers a continuous and trouble-free run and capital costs are also reduced compared with the roller method. The idea was not a new one: it had been patented as long ago as 1902 in America—although Pilkingtons did not know this when they applied for their United States patent. But the inventor, William Heal of Indiana, had never produced a continuous flow from the furnace, still less a glass of satisfactory quality. Interestingly this was one fairly rare occasion where America lagged badly in exploitation of a good idea.

Pilkington began production with their process on a pilot plant in 1953 and it took six years to get a good flow going. By this time the plant, though it was producing good glass, was rather run down. So they renewed the broken-down parts. Panic. They promptly produced nothing but cullet (bad glass). Sir Alastair recalls: 'It took us nearly three months of investigation to discover that when we first made good glass it was partly due to a fluke and that a vital part of our success had been due to a broken part of the plant. As soon as we understood the problem we made a set-up which produced similar conditions to those with the broken part.' It took £7 million to develop float glass. From that point the

Pilkington process made consistently good glass and the firm has never looked back. By 1971 some forty float plants were in operation in sixteen countries and more still are under construction or planned. In 1968–9 Pilkington earned £5,400,000 from licensing. The figure rises each year and by 1980 the firm will have earned an estimated £100 million from licensing.

In 1971 Pilkington added a new £10 million float plant to the three it already had in St Helens, and there were two in Canada. Fresh plants are following in Australia, Argentina and South Africa -a welcome diversification after the depressions of the home market and the traumas of the seven-week strike. Neat licensing agreements mean that foreign users of the process have only limited markets in the world, with Pilkingtons keeping the most promising for itself. Any improvement developed by a foreign user of the float process can be adopted *free* by Pilkingtons. In return Pilkington makes its new improvements available to licensees. With pre-tax profits edging beyond £20 million a year the firm's prospects are rosy, and its stake in research continues to grow. The £6 million research and development centre at Lathom, eleven miles from St Helens, is currently working on such exciting possibilities as a glass that can be tinted and will change colour at the turn of a dial. Already Pilkington produces glass that can darken automatically in sunshine. Such ideas will maintain the firm's world lead in the fast-moving field of glass technology.

Ever since John Boyd Dunlop, a Scots-born Belfast veterinary surgeon, became the first man to fit a cycle with a pneumatic tyre, the name Dunlop has played a leading role in the development of wheeled transport.

John Dunlop began experimenting with tyres in 1887. A doctor had advised cycling for the health of his son, but said the benefits would be all the greater if only a way could be found to prevent the jarring effect of the solid-rimmed wheel. First Dunlop tried a hose-pipe filled with water but this was a failure. Then he got the idea of a rubber tube filled with air under pressure contained in a protective canvas tyre shod

with rubber strips. He made a pneumatic tyre for his son's tricycle, and the superior comfort of riding on a wheel encircled by a cushion of air was at once obvious.

The device was patented in 1888 and production began in 1890, but unknown to Dunlop another Scot, Robert William Thompson, had first patented the principle of a pneumatic tyre for horse-drawn vehicles in 1845. However, the Dunlop company was able to protect its position by buying up various accessory patents. Though many, including J. K. Starley, the inventor of the safety bicycle and nephew of James Starley the 'father' of the bicycle, predicted that the new tyre would not last longer than a season, the derisive jeers with which it was first greeted turned to respectful admiration when pneumatic-tyred safety-bicycles regularly beat their rivals in races. Dunlop, who died in 1921, did not make a great fortune from his invention, but it was from those beginnings that the company which bears his name became a household word. Dunlop were the first in the field with aeroplane tyres (1910), bullet-proof tyres (1917), giant pneumatic tyres (1921), latex foam rubber (1928) and disc-brakes, first used in aircraft in 1953.

The disc-brake had in fact been patented as early as 1902 by one of the most inventive and least recognized geniuses the motor and aviation industries have ever known F. W. Lanchester. An early builder of motor-cars far in advance of their time, it was Lanchester's misfortune that many of his inventions were taken up long after he first thought of them.

None the less to Dunlop goes the credit for making the disc-brake work commercially. Its advantage is that it gives constant performance without loss of efficiency due to overheating. After success with aircraft the company designed a disc-brake for cars. This proved itself in spectacular fashion when Jaguars with disc-brakes finished first, second and fourth in the Le Mans race of 1953. Four years later Jaguars were the first to use disc-brakes as standard equipment in production cars. Another Dunlop achievement in braking is the Maxaret anti-skid device. By applying brake pressure in short bursts by means of valves, the Maxaret automatically

prevents wheels from locking in a skid. Besides its much-valued aircraft use, the specialist car firm Jensen uses the Maxaret in production cars and several heavy lorry manufacturers now offer it as an optional extra.

One of the greatest hazards a motorist can face in wet conditions is that of aquaplaning, which is the build-up of a water-wedge in front of a tyre, causing it to float on a film of water. As with the disc-brake Dunlop did their first work on aircraft aquaplaning, where runway water had often caused aircraft to become uncontrollable, with disastrous results. Extensive tests into the cause and effect of aquaplaning have resulted in improved tread design for aircraft and car tyres and the dangers of water build-up have been greatly reduced. New tread patterns greatly assist dispersion of water by means of grooves in the tread leading to minute channels on the tyre shoulder.

Another great step in tyre design now in commercial use is a safety tyre which will not blow out or deflate if there is a puncture. The secret of Dunlop's new 'Total Mobility' tyre is a new construction with very strong sidewalls which allows a safe blow-out at 100 m p.h. It will cover 100 miles at 50 mph after a puncture with no effect on steering, handling or the tyre itself. This is the most important development in tyre design since Michelin's radial tyre before the last war. Besides the important extra element of safety there is the convenience of being able to dispense with a spare tyre, which means more boot room. The tyre, trade-named the Denovo, costs per four wheels around £40 more than a conventional set, but its life is longer.

Dunlop is experienced in advanced suspension systems—it makes Alex Moulton's hydrolastic suspension used exclusively on British Leyland cars. In 1957 it introduced its own Pneuride air suspension for freight and passenger-carrying vehicles. Basically the system uses levelling valves operating on each axle to provide a constant and controlled level of suspension, which is particularly useful in the road-holding performance of partly laden vehicles.

Dunlop's influence extends beyond wheeled transport to

maritime users and the company has achieved great success with its floating hose now in use in nineteen countries from Angola to Iceland. In an age of overcrowded ports and of super-tankers that are difficult to accommodate in any but the largest harbours, it is obviously very useful if a tanker can off-load its cargo some way out to sea.

Till recently the standard practice was to use an ordinary suction hose fitted with buoyancy devices. This was not only cumbersome but there was always the risk of damage to the buoyancy devices which could prove difficult to get at and repair. So Dunlop designed a hose with its own built-in buoyancy. It is a hose wrapped around with foam sheeting, a simple enough concept, but now a highly profitable Dunlop patent. The company's hose division, given the Queen's Award to Industry in 1970, now has exports exceeding £3 million a year, to which the floating hose makes a substantial contribution. It comes in sizes bigger than the old maximum for hoses, of a 16-inch internal diameter, which was not big enough to off-load a supertanker at speed. Dunlop's 24-inch hose still floats satisfactorily when full of seawater. The Dutch are making extensive use of it in large drainage projects where sand and silt can be shifted by these flexible and movable hoses. This dispenses with the costly process of laying steel pipes and having to re-lay them for the next area of operation.

Dunlop has also concerned itself with the passenger on foot by making a sort of escalator-cum-moving-pavement called the Starglide. Those in use at Japan's Expo 70 at Osaka carried a million people a day, but were still in splendid shape after round-the-clock service over many months. Starglide is now used at airports and terminals all over the world, but for safety reasons is limited to $1\frac{1}{2}$ to 2 miles per hour.

The next stage is a high-speed pedestrian conveyor belt, which Dunlop are now developing with the Batelle Institute in Geneva, using NRDC funds to support detailed design study. Based on the successful Starglide the new system, known as Speedaway, reaches speeds of 15 mph and even 20

mph, but the passengers can still get on and off safely by means of stations along the way equipped with Integrators. These either accelerate or decelerate passengers in progressive stages. For instance a passenger gets on the treads of the Integrator at a speed of about 2 mph, roughly the equivalent of getting on an escalator. The treads then accelerate, moving sideways and forwards at the same time in an arc, till finally the speed synchronizes with the 15 mph or so of the main belt.

The Speedaway that first worked in Geneva in 1971 as a full-scale model was foreseen by H. G. Wells as long ago as 1899 when in *The Sleeper Wakes* he wrote of a 'thin extraordinary roadway . . . an endless flow rushing as fast as a nineteenth-century express train, an endless platform of narrow transverse overlapping slats with little interspaces that permitted it to follow the curvature of the street'. The Speedaway could be a boon to crowded shopping centres like Oxford Street, offering instant frequency (unlike the bus or underground services) and a generally higher average speed than either. It can run below or above ground (in which case it would be covered) and stations in a high street could be run directly into the largest department stores.

Chapter 23

AVIATION

'I feel as a Britisher rather ashamed we are so completely out of it,' Lloyd George had said in 1909 when talking about Britain's contribution to the new industry of aviation. But the First World War changed all that. Many first-rate aircraft were developed. These included the Vickers Vimy bomber in which Alcock and Brown made the first non-stop trans-atlantic flight in 1919 some eight years ahead of Charles Lindbergh's first solo flight. For the last half-century Britain has held a leading place in aviation. Its most significant contributions include the birth of a jet-engine industry and the world's first turboprop and jet airliners. A few other British milestones of the last half-century may be noted. The Handley Page slotted wing of 1919 which smoothed out the airflow over the wing all but eliminated the once common stall-and-spin type of crash and was a notable aid to air safety. The constant-speed propeller which enabled the airscrew to give optimum thrust in all conditions by varying the pitch of the blades was first patented in Britain in 1924 and test-flown in 1926. Using the Supermarine seaplane Britain won the famous Schneider Trophy speed contest (flown once every two years) three times in succession in 1927, 1929 and 1931, thus winning the trophy outright. This was the proving ground of the streamlined monoplane from which R. J. Mitchell developed the Spitfire.

In aero-engines, which climbed steadily in power past the 1,000-hp mark, Rolls-Royce were world leaders in the manufacture of liquid-cooled engines. The Bristol Aeroplane Company made some of the most widely used air-cooled engines. An early radial engine, the Jupiter, was manufactured in sixteen countries. Frank Whittle was first to have a

jet-engine running on a test-bed in 1937 – several months ahead of the German Dr Hans von Ohain.

Though the German Heinkel 178 made the world's first jet flight in 1939 its flying time was minimal and it did not have the sustained flight success of the Gloster Whittle which first flew in 1941. The Gloster Meteor was the only Allied jet to see service in the war, going into operational service against the flying bombs in August 1944. But the jet aircraft – British and German – arrived too late to make much impact on the war. In the immediate post-war era the British turbojet was the dominant influence. From the export of a Whittle jet to America in October 1941, which started the United States General Electric, and a de Havilland engine in 1943, the Americans acquired all their initial know-how. Until 1941 they had taken little interest in jet propulsion. 'So it was that the entire turbojet engine industry in the United States grew directly from the acquisition of two British engines,' records the aviation historian Charles H. Gibbs-Smith.[1] After the war Pratt & Whitney, now the world's biggest jet-engine manufacturers, were pressurized by the United States Navy, who had been greatly impressed by the Rolls-Royce Nene, into taking out a manufacturing licence, so it was through Rolls-Royce that Pratt & Whitney also got into the jet business.

What is perhaps less well known is that the Russians too acquired their jet know-how from Britain when the controversial and possibly misguided decision was taken by the Government to send Nene engines to Russia soon after the war. Rolls-Royce's chief engineer, Dr Stanley Hooker, recalls: 'The Russians, including Artem Mikoyan, the designer of the Mig, came to see us at Derby early in 1946. To me they were still our great and glorious allies who had helped us tear the guts out of the Germans. I gave them all the help I could.'[2] The help was eagerly seized on. So Whittle and Rolls-Royce may therefore fairly claim to have sired the turbojet industry throughout the world. Today Rolls-Royce

1. *Aviation: an Historical Survey*. HMSO, 1970; page 213.
2. Conversation with the authors.

is the only major manufacturer of jet-engines in the Western world outside the United States. It has a fifth of the world market in the West, roughly the same as America's General Electric. Pratt & Whitney have about 40 per cent.

The traditional dominance of the heavyweight American aerospace industry did not stop Britain having the world's first civil jet-airliner, the Comet, and the world's first turboprop airliner, the Vickers Viscount, one of the great aircraft of all time. The Rolls-Royce powered Viscount, made by Vickers (now part of the British Aircraft Corporation) was the workhorse of the air in the fifties and early sixties. Between 1953 and 1961 a total of 444 Viscounts were manufactured, and the plane has seen service with more than forty airlines. As an aircraft with few vices the Viscount has earned from pilots the same affection as they had for others in a very special category, such as the Dakota. It was the right aircraft for its time and it had no immediate equivalent. Ironically the Viscount was all but killed at birth when BEA, suspecting the as yet unproven turboprops, ordered a piston-engine rival. That was in 1947. But the designer, Sir George Edwards, never lost faith in the Viscount, which performed like the good child in the fairy story throughout its test flying. The breakthrough came in August 1950 when BEA, under their new chief executive Peter Masefield, ordered twenty of the 53-seat Viscounts.

Because of the appeals to patriotism, and the heavy inducements offered by American manufacturers, breaking into the American market has never been easy for foreign manufacturers. But the British Aircraft Corporation after years of painstaking sales effort have achieved major success with their Rolls-Royce engined BAC 1-11 'bus-stop' jet. Well over 200 have been sold worth a total of more than £320 million. Two-thirds were for export, of which half were to the United States. The twin-engines-at-the-back One-Eleven with its very low cost per aircraft mile, which means it can operate economically with a low passenger load, forced its way into the international markets on grounds of sheer economics. Robert E. Peach, chairman of Mohawk Airlines,

one of the largest United States customers declared: 'I back Mohawk. But the way I do it is by buying British.' The One-Eleven began its life as a private venture with no promise of orders or support from the Government. It was designed for an international market—the only way to recover the high development and tooling costs in modern aircraft. The One-Eleven has earned substantial profits for its makers and the country. Variants to the main design have still further expanded the market. The 'stretched' One-Eleven 500 with an additional twenty seats, making it a 100-plus-seater, has cut seat-mile operating costs by 15 per cent. The short-fuselaged One-Eleven 475 designed to operate from short airfields grass or gravel—in less developed countries should boost sales in the seventies to an eventual total of 280—around one-fifth of the world market for jets of this class. Like the Viscount, the One-Eleven when it came into service in 1965 was not just the first in its field but the only 'bus-stop' jet for two years. It has continued to reap glowing testimonials from foreign operators.

Other excellent planes like the Hawker Siddeley Trident and the supremely comfortable and vice-free airliner the VC 10 were dovetailed to meet the requirements of airlines at home—to the detriment of overseas sales. Consequently when the fifty-fourth and last VC 10 took off from Vickers's factory at Weybridge in February 1970, the most popular plane on the transatlantic run had failed by a long way to cover its research and development costs. The Trident has fared better with well over one hundred planes sold, including a valuable £120 million order for thirty-five aircraft from the People's Republic of China which has transformed a project almost too closely tailored to BEA requirements into a major export success. This lifting of the Bamboo Curtain could well be the start of an exciting re-equipment programme. For apart from a dozen Viscounts and the Tridents the Chinese air fleet consists mostly of obsolete Soviet piston-engined aircraft. China is unlikely to re-equip with Russian planes. Purchases from America are limited. So the way is

open for the British planemakers, and Concorde has aroused interest.

Hawker Siddeley have two dependable civil aircraft that have broken through the 200-plane sales barrier. One is the turboprop feeder-liner jet, the Hawker Siddeley HS 748. By the end of 1970, 250 had been sold of which some 200 were for export, worth around £100 million. The HS 125, a six- to eight-seat 500-mph executive jet, has achieved sales of over 250, worth more than £70 million. More than 200 HS 125s have been exported to twenty-two countries and sales to North America have been worth £40 million.

In military sales Britain has achieved some remarkable successes with the Hawker Hunter jet fighter (over 1,000 exported) and the English Electric (now part of BAC) Canberra. Though it first flew in 1949 this dependable twin-jet bomber was still in service over twenty years later with the RAF and with the USAF. Because of its reliability it was used operationally in Vietnam despite a plethora of more up-to-date equipment. Over 1,400 Canberras have been sold and in 1970 the plane was still being exported. In the field of naval flying Britain has contributed three revolutionary inventions for use on aircraft-carriers: angled flight decks, mirror-landing sights and steam catapults. Modern catapults are so powerful that they can accelerate a heavy jet from standstill to 145 knots in less than 200 feet.

Following the government-sponsored mergers in the aircraft industry Hawker Siddeley and the BAC (50 per cent owned by Vickers, 50 per cent by GEC) are now the only two major airframe manufacturers in Britain. Rolls-Royce, after their merger with Bristol Siddeley in 1966, are now the only aero-engine makers in the United Kingdom. So the British aerospace industry, employing 200,000 men and women, is now fairly well rationalized and in a good position to retain and even expand its share of the international civil market, estimated by the Commission of the European Economic Community at £28,000 million in the decade beginning in the seventies. The market for military sales in the same period is around £90,000m.

Missiles as well as aircraft are being sold. Already the BAC has won a £47 million contract from Iran for its Rapier anti-aircraft missile in face of intense French and American competition. The Rapier is emerging as a world leader in the field of missiles to intercept aircraft that fly too low for the radar defence screens. A Rapier battery needs only three men to operate and is cheap and mobile. The BAC expect sales of £300 million during the seventies. BAC's big project experience in Concorde has also earned it valuable contracts in the United States for the American space programme.

In addition there is the market in avionics, the back-up industry to Britain's aircraft factories which embraces airport equipment, aviation electronics, radar and such successes as the Decca Navigator, which has been installed in 2,500 aircraft of the world's leading airlines. It is also used by some 16,000 ships, from 30-ft boats to super-tankers. It enables fishing vessels to go back to the scene of a big catch with great precision. Helicopters fly through the sea mists of the North Sea to service oil-rigs and change crews in conditions that would be impossible for them without the Navigator. The Decca system was invented in 1937 and first used in the war with the utmost secrecy, when it enabled minesweepers to clear a precise path across the Channel for the invasion of Europe. It was first used commercially in 1946.

Transmitters on the ground send out radio signals which are processed by the Omnitrac computer on the aircraft, and from this information a pen continually plots the aircraft's course on a moving pictorial chart. The trace is easily erased and charts can be used again and again.

The Decca system is an *area* navigation aid as opposed to the American VOR system (Very High Frequency Omnirange) which obliges pilots to fly on a radial or spoke to or from the VOR navigator beacons. This 'point-source' system of navigation is incredibly wasteful of airspace, since aircraft are bunched into narrow channels. It was adopted for standard international usage by the International Civil Aeronautics Organization in 1959 in preference to area coverage. Airline pilots in particular see the decision as a most un-

happy one. With the Decca Navigator a pilot can fly direct to his destination instead of tracking his way from one beacon to the next. F. D. Hall, chief executive of Eastern Airlines, who bought the system for their DC-9 air-shuttle fleet, declares: 'The Decca system has the capacity to create aerial freeways where there are now only crowded highways. This equipment reduces air travel time on shuttle flights an average of 10 per cent.'

Decca's Omnitrac computer can use information from all types of navigational aid including VOR, so that it can be used alongside the point-source system, but its real advantages will not be achieved unless it is universally adopted - and then the gains will be immense in reducing stacking and runway delays and above all in improving air safety. In the United States in 1969 there were 38 collisions and 2,000 reported near misses and in the United Kingdom 161 confirmed near misses.[3] With air traffic increasing by around 50 per cent every five years it is plain that present outdated systems of navigation have reached breaking point. Without a speedy change in the system not only will stacking problems increase but it is only a matter of time before there is a major tragedy resulting from a mid-air collision.

Newspaper comment on point-source navigation has likened it to 'Blind Man's Buff in the air' and, more macabrely, 'Things that go bump in the flight'. The basic weakness of point-source navigation was well defined by Captain Laurie Taylor, chairman of the British Airline Pilots Association, speaking at a BALPA symposium in London in November 169: 'We have taken a vast ocean of air space and by using point-source navigation aids we have converted that ocean into limited capacity canals.' He added: 'There is much talk about freedom in the air . . . nevertheless the first freedom is freedom from fear.'

The 1959 decision in favour of VOR, taken largely because of heavy American pressure, could now be revised. If so Decca's prospects are golden. The achievements to date

3. *Accidents to Aircraft on the British Register, 1969*. Department of Trade and Industry.

are solid enough. In the quarter-century since the first transmitter chain was established in England, thirty-seven more had been built, covering over 7 million square miles of the earth's surface, from Canada and the eastern seaboard of America to Europe, South Africa, the Persian Gulf, India and Japan. In any one of these 7 million square miles a pilot can know where he is to within one mile. Designed for virtually automatic, unmanned operation, Decca transmitters can be used in inaccessible areas under remote control, such as one station in Norway which is snowbound for much of the year. Capital investment required in building construction is minimal. It has the great advantage of being a common-user system so that its benefits can be shared by ships and aircraft, civil and military users. Costs are usually paid by the government concerned.

One major user has been British European Airways whose Viscount fleet in the fifties was one of the first to use Decca and the pictorial display. The airline, biggest in Europe, was also the first in the world, in June 1965, to make an automatic landing with passengers. It spent £6,500,000 on developing its Autoland system, which is made by Smiths Industries Ltd and by 1970 was averaging ten landings in scheduled flights. The Autoland system, triplicated so as to produce a failure rate of better than one in ten million, permits low-visibility landings which can be attempted by no other airline. By 1971 it was possible to operate down to a cloud base as low as 12 feet, and the next step, nil-visibility landings on scheduled flights, was at hand.

Apart from the United States and the USSR Britain is the only country with a comprehensive aerospace industry composed of the three essential factors – airframes, engine and equipment. Over the next decade a 15 per cent share of world civil markets some £4,500,000—can be expected, with substantial benefits to the balance of payments. Russia, partly because of a reluctance to supply technical data adequate for a certificate of airworthiness, and partly because she could exert blackmail on supply of spares, which could

jeopardize a massive investment in airliners, is unlikely ever to gain a serious entry into Western markets. This at least is the view expressed to us by Concorde's sales manager Pat Burgess.

The British industry has not been blessed with universally happy public relations. Many home-grown experts—to the delight of American rivals—have damned the industry for its large requirement of research and development funds and suggested a buy-American policy. Yet in 1973 the aerospace industry's exports exceeded £500 million or treble the 1965 figure and a quarter goes to the United States. Aircraft workers average £2,500 of exports per head per year, over three times the national average. If account is taken of the aerospace imports that are saved by having a flourishing domestic industry, aviation's contribution to the balance of payments is over £1,000 million a year. So the continued prosperity of the industry is vital to our economy.

Britain has co-operated internationally to design and build the Concorde, the European A 300 B Airbus (Hawker Siddeley, though not the British Government, is part of an international consortium which includes the French, Germans and Dutch), the Anglo-French Jaguar aircraft and the MRCA (the Anglo-German-Italian multi-role combat aircraft). But international collaboration is not the sole answer, and no other government of any major European power as yet believes that it is. The Commission of the European Economic Community has noted with concern that though Europe has 37 per cent of the world's commercial fleet it has only 7 per cent of its production. Looking at the vast commercial possibilities of the seventies the Commission commented: 'With such market prospects opening up, it would be a matter for anxiety if European industry failed to strengthen its position in this sector'[4] Reasons of national prestige and security enter the argument, but equally important is the 'spin-off' effect on the rest of the economy of an advanced technology industry like aerospace. Concorde has aided at least three new techniques—electron-beam welding,

4. The *Guardian*, 7th October 1970.

numerical control machining and electro-chemical machining. It has improved knowledge of a number of fairly exotic metals and countless suppliers to the main firms have benefited from the high technology needed. The effect is to create a new reservoir of advanced technical skills which can be used in many directions besides aerospace. So the aircraft industry, for all its critics, has a powerful raison d'être.

Nor could it achieve its success without some of the most sophisticated research in the world, much of which takes place at the Royal Aircraft Establishment at Farnborough—also the home of the famous Air Show, now a European affair, which draws an attendance of over 300,000.

Farnborough, birthplace of the first powered flight in Britain by Samuel Franklin Cody on 16th October 1908, is probably best known for its painstaking accident investigation, like the probe into metal fatigue that caused the Comet crashes in 1954. Farnborough reconstructed the plane from pieces salvaged from the bottom of the Mediterranean.

Farnborough is also actively engaged in various aspects of space research and travel. America's spacemen—including the first two to land on the Moon—use water-cooled 'underwear' invented and developed by RAE scientists. These 'space combinations' which go under the spacesuit proper have hundreds of tiny tubes circulating water next to the astronaut's skin. The effect is to keep him at a comfortable 70°F. instead of being roasted in the fierce sunlight of outer space. The Americans had planned to use a system of air-cooling, but turned to water when they saw the results of the Farnborough tests.

Many of the basic ideas for supersonic airliners evolved at Farnborough, including Concorde's delta-shaped slender wings, which minimize drag and 'sound barrier' shock waves. As early as 1956, when supersonic transport was still thought to be an impossible dream, it was the RAE's initiative which persuaded the Government, airlines and manufacturers to join in a Supersonic Transport Aircraft Committee, under the energetic chairmanship of the RAE's present director Sir

Morien Morgan. The committee's main recommendation (which may well have leaked to the French before co-operation with them was envisaged [5]) was for a 150-passenger aircraft flying at Mach 1·8 (Mach 1 is the speed of sound or 760 mph at sea level). How shrewdly the committee foresaw the shape of things to come can be gauged from the fact that Concorde carries up to 132 passengers at Mach 2.

Another big contribution to supersonic flight made by Farnborough was to clear up a misconception left by American research. Aerodynamic requirements at supersonic and subsonic speeds are in conflict. An American report had indicated that the slender wings necessary for supersonic flight would prove extremely unstable at landing-speeds. Unwilling to take this research on trust the RAE's W. E. Gray, a World War I fighter pilot, conducted research with a small wooden model launched by hand from a helicopter. He found that given sufficient wing-span, the low-speed handling of slender wings was entirely adequate, a fact confirmed in wind-tunnel tests and with an experimental Handley Page aircraft. So one more major obstacle to the SST had been removed. The STAC was equally shrewd when it decided that a plane flying at Mach 2·7 would take too long to develop because of heat problems, against which conventional alloys and systems would not stand up. Fifteen years later the Americans have had to abandon their plans for a Mach 2·7 airliner. The heat problem was one of the reasons.

Today the RAE is engaged on the most complex and thorough-going research ever devised to test a supersonic aircraft. It will make Concorde the safest passenger airliner ever built. Using £2 million apparatus, rather like a huge stainless steel glove, a test Concorde that will never fly is being subjected to a continuous 'freeze and fry' process—twenty minutes of extreme heat followed by twenty minutes of extreme cold. First the aircraft is heated through giant ducts in the glove, which is packed with insulating wool, then frozen with liquid ammonia. At the same time as the fry giant rigs will give the wings and tail 200-ton tweaks. All

5. John Davis, *The Concorde Affair*. Leslie Frewin, 1969.

this will show how much the aircraft will stand. In one hour it will be possible to simulate the effect of two 3-hour flights, reflecting all the pressure and temperature changes involved. To be economic Concorde must actually be in the air for over a third of its life—say 3,500 hours a year. The speeded-up 'freeze and fry' and the giant tweaks mean that before the first Concorde flies commercially in 1974 it will already have 'flown' one ordinary lifetime in the glove, whose official and understandably grandiose title is Major Fatigue Test Thermal Duct. The test Concorde on its rig at Farnborough will thus anticipate fatigue problems well ahead of any plane in service -an early warning system that could have averted the Comet disasters. It is a safety-first-plus policy for a revolutionary plane.

Concorde faces another hazard the danger of colliding with a rainstorm at twice the speed of sound. A collision with even one raindrop at around 1,300 mph can cause scratching and erosion visible to the naked eye on many types of aircraft material. The erosion caused by a rainstorm is correspondingly greater—and could result in substantial wearing away of the aircraft Indeed no one, even in military aircraft, would care to risk flying through a heavy rainstorm supersonically. Until a few years ago meteorologists did not believe that Concorde would meet any rain at all at its proposed cruising height of twelve miles. Then the American Air Force encountered the problem over the Pacific with high-flying jet fighters.

Concorde's designers are confident as a result of elaborate and ingenious tests at Farnborough that given an appropriately streamlined shape and meticulous attention to the surface, so that even rivets are streamlined, materials can be used which will reduce rain erosion to minimal levels.

On the argument that what goes up must also come down, we should also remember the immense contribution to aviation safety made by the Martin-Baker Aircraft Company's ejection seat. Whenever you read the headline 'aircraft crashes—pilot ejects to safety'—it's an odds-on-chance the pilot's life has been saved by the British designed and made

Martin-Baker ejection seat. It is the best and most widely used in the world, and for over 3,000 men it has meant the difference between life and death. They are all members of the Martin-Baker Club, and entitled to wear the ejectee's tie of red triangles on a blue background.

Martin-Baker, which has its factory and headquarters at the bottom of a leafy lane near Denham golf-course, had made more than 38,000 seats by the end of 1970. About 80 per cent of output goes for export, and seats have been sold to forty-eight countries. Export earnings totalled £60 million between 1956 and the end of 1970. Beyond question Martin-Baker lead the world in their own field; European competitors long ago packed up; the German and Italian air forces both switched to Martin-Baker instead of an American seat. In 1967, for instance, the Luftwaffe scrapped all the Lockheed ejection seats from operational models of its ill-fated American Starfighter warplane, variously known as the Jinx Jet and the Widow Maker, and installed the Martin-Baker instead The number of deaths diminished dramatically. Soon afterwards the Italians followed suit.

The man behind this remarkable invention is a stocky Northern Irishman in his seventies called Sir James Martin, son of a County Down farmer. Many are the tributes that flow into Sir James's office from grateful pilots all over the world He actually took out his first aviation patent as long ago as 1911 and started his firm at Denham 'with just a man and a boy' in 1929. He is still managing director and chief designer very much the boss of 1,000 employees who know him affectionately as 'Guvnor'. His partner, Captain Valentine Baker, a distinguished airman who taught flying to the Duke of Windsor when he was Prince of Wales, was killed in the war when a prototype Martin-Baker fighter he was testing crashed because of engine failure. That was the end of Martin's aircraft building. But his fertile mind, which had already created a variety of remarkable inventions, like the anti-barrage balloon cable-cutting device fitted to some RAF bombers, soon turned to other things. With plane speeds increasing and with the advent of the first jet-fighters it became

almost impossible for a pilot to escape from a crashing plane through a slip-stream of 400 to 500 mph. By 1944 the RAF and Air Ministry were desperate to find some means of getting the pilot out. So they approached Sir James. He conceived the idea of firing the pilot out of the aircraft on his seat by means of a gun, using gunpowder and cordite.

There were several tests on dummy bundles fired from aircraft. It was on 24 July 1946 that the seat first proved itself in flight with a human bundle, when Martin-Baker's test parachutist Bernard Lynch exploded himself into the unknown from the back seat of a Meteor and lived to tell the tale. In all, this courageous man made seventeen airborne test ejections, and his bravery was a major contribution to the development of the seat.

The first emergency ejection was by test-pilot Jo Lancaster in May 1949 when his prototype went out of control. On Armistice Day 1951 Flying-Officer K. J. Blight serving with the RAAF in Korea became the first airman on active service to use the seat. All the while the seat was being refined and improved. But in the mid fifties there were a series of fatal accidents to Navy and RAF planes on take-off; the pilots had died because they had ejected at too low a level and the parachute had not opened sufficiently. Could the parachute be effective at zero altitude provided the plane had a fair amount of forward speed? Most experts regarded any kind of runway ejection as a fair prescription for suicide, but James Martin reasoned that it could be done if the time gap between the firing of the seat cartridge and the opening of the parachute were reduced from three seconds to one and a half seconds.

As always Martin was the most meticulous man about safety. Before the first live runway ejection he made numerous tests with simulated bundles approximating to the weight and size of the man who was to be ejected, former Battle of Britain pilot Squadron-Leader John Fifield. Even so the atmosphere was exceptionally tense at Martin-Baker's Oxfordshire airfield at Chalgrove on that autumn morning of 3rd September 1955. Though Martin was convinced he had

got his calculations right few others thought so—and that included the Air Ministry experts. The two-seater Meteor revved up with Captain John Scott at the controls and bounded down the runway. In six seconds it was all over. Fifield fired himself out, the parachute opened and he returned safely to the airfield. It had been the longest six seconds anyone could remember.

By 1957 the United States Navy was beginning to show interest in the Martin-Baker seat. A successful demonstration led to a United States Navy contract and paved the way for millions of dollars of exports to America. At the height of the Vietnam war 70 per cent of the firm's output was going to the United States and it was saving as many as 400 airmen a year.

Soon Sir James Martin moved to his next revolutionary development—rockets. The pilot was ejected by rocket power combined with the gun and it worked out smoother as well as safer, especially for zero altitude ejections.

In March 1962 Wing-Commander Peter Howard, an RAF doctor at the Institute of Aviation Physiology, made the first rocket ejection from a plane. For runway ejections the rocket gets the pilot out of the way of the crashed plane's fireball. It is also indispensable if a VTO aircraft with no forward speed is crashing on take-off or landing.

Martin himself, knighted in 1965, owes his success to patient and superlative skill as a designer rather than to any sales gimmick—that and the bravery of men like Bernard Lynch and John Fifield.

Chapter 24

WHITTLE AND THE WORLD'S FIRST JET

The world's first jet-engine was British. It was started up on its test-bed on 12th April 1937 at the British Thomson-Houston turbine factory in Rugby fully four months before the Germans had their first primitive design going. At the time neither side knew of the other's experiments. It was the first step in a process that was to revolutionize civil and military aviation, but as an experiment it was almost too successful. After turning the jet over with a starter motor to 2,000 revolutions per minute the jet engine itself roared into life. Then, in the words of its inventor Frank Whittle, 'it could not be kept under control and ran away. So, too, did everyone standing around, except myself. I was paralysed with fright.'

And no wonder. A jet that runs away (not in the sense that it charges across the factory floor, but that it starts to overspeed uncontrollably) can blow up, hurling pieces through the air at almost 1,000 mph. In fact Whittle was at the controls struggling desperately as the engine pitch rose 'like an air-raid siren' to tame his flaming monster. The jet nozzles extending through an open window belched out sheets of flame. Whittle recorded later: 'I have rarely been so frightened in my life.' Eventually the engine was brought to a stop.

Next evening the experiments were still more frightening, with the combustion chamber running red-hot, which in turn ignited clouds of fuel vapour so that flames danced along the top of the engine. It took several experiments to bring the engine under proper control, and even then much redesigning and over two more years of hard work were necessary before the Air Ministry was finally convinced that

the jet-engine was a feasible proposition. But Whittle himself, who in 1937 was a mere flight-lieutenant of twenty-nine on a year's graduate research leave from the RAF, never lost faith in his invention, though much official apathy—to begin with there was no government sponsorship of the jet—and chronic shortage of cash gave him every reason to do so.

Whittle was the son of a skilled mechanic and inventor who had his own small business in the Midlands. At the age of four, just eight years after the Wright brothers' historic flight, he was already interested in the air and was playing with model planes. At the age of eight he recalls buying a 2*d*. rocket with a friend. Since it had no stick they found one and tied it loosely to the rocket, jammed it into a workbench at home, lit the blue touch paper and retired. Within seconds the rocket was whizzing about, striking Whittle on the chin and causing the two boys to jump around until it eventually exploded. 'It left me with a burn on the chin, but it seared into my mind the power of propulsion by jet.' Later, in his father's little factory at Leamington Spa, he was allowed to drill valve stems and do lathe work. After a none too distinguished school career he applied to join the RAF. He was turned down on grounds of smallness and refused leave to try another time. Despite a tough programme of exercises and a special diet he was still only 5 ft 3 in. Finally he disguised the fact that he had previously applied and wangled his way into the service as an apprentice aircraftsman at Cranwell in September 1923 at the age of sixteen. It was as a flight cadet in 1928, when he was still only twenty-one, that he first wrote the thesis that was to start a revolution in flying throughout the world. At that time RAF front-line fighters had a top speed of 150 mph. Confidently Whittle looked forward to speeds of 500 mph, especially at high altitudes, where there was lower atmospheric pressure. He readily saw that the efficiency of the propeller declined rapidly over 400 mph and that even the most advanced propeller-piston engine combination would be inadequate. At first his mind turned to rocket propulsion and what we now call the prop-jet principle.

Toward the end of 1929 came the inspiration of combining a jet propulsion arrangement with a turbine. As early as A.D. 150 Hero of Alexandria had proposed a primitive steam turbine, using the reaction of steam-jets to rotate a spherical vessel. The principle of the turbine had again been propounded by an Englishman, John Barber, in 1791. But even when perfected it was regarded as a means of driving a shaft. Whittle's genius was to link the two principles of jet stream and turbine and more importantly to realize their almost limitless potential for aerial flight.[1]

Yet at no time in his pioneering days was Whittle backed by big money or by the enthusiasm of big business. He patented his invention in 1930 and the Air Ministry had so little interest that they did not stipulate that it should be placed on the 'secret' list.

As a self-convinced youngster of twenty-three Whittle then tried to peddle his jet-engine idea to the turbine manufacturers British Thomson-Houston, the engine manufacturers Armstrong Siddeley, as well as two or three other firms, but all turned down the idea either on the grounds that development costs would be too high in a time of economic depression or that there were no suitable metals for the very high operating temperatures the jet would require.

In 1935, when Whittle was taking the Mechanical Science Tripos at Cambridge University, he was so hard up that he could not afford the £5 fee needed to renew his jet-engine patent. Nor were the Air Ministry, although they were paying for his course at Cambridge, prepared to fork out this trifling sum.

1. The basic principle of the jet is fairly simple. Air from outside is taken into a compressor and compressed to a level four or five times (or in the latest jets up to twenty-seven times) the outside atmosphere. It passes into the combustion chamber where fuel is added and burned, raising the temperature to around 1500° F. This hot blast is passed through a turbine (which drives the compressor) and then through jet nozzles. The effect of the blast as it leaves the rear of the jet is to produce thrust.

Only the year before, the Secretary of State for Air had written that 'we do not consider that we should be justified in spending any time or money on it [jet propulsion]'. Scientific investigation, thought the Minister, gave no indication that jet propulsion could be a 'serious competitor to the airscrew-engine combination'. Happily a consulting engineer called Mogens Louis Bramson was impressed when Whittle, a 'bright, confident' lieutenant, came to see him with his theory. After studying it for two weeks Bramson 'got quite excited'.[2]

Though the patent had lapsed Bramson approached a firm of investment bankers, O. T. Falk & Partners, who agreed to put up money to build an experimental engine. So in March 1936 the firm of Power Jets Ltd was formed – with an initial subscribed capital of only £2,000. It was some time before they raised as much as £10,000. The cost of building the first engine was just over £4,200.

When Whittle was visiting the various component manufacturers he was also preparing for his finals. This crowded two-year course was rounded off with five weeks' intensive study, as a result of which he succeeded in getting a First. He was still a serving officer and the Air Ministry then gave him a post-graduate year on research and later transferred him to the Air Force Special Duty list.

Apart from that there was no official encouragement. Several times the project almost ground to a halt for want of funds. There was the added difficulty that because Whittle was a serving officer there were problems about the financial exploitation of his invention by private firms. This made it doubly difficult to raise private funds. In 1938 the Air Ministry provided a meagre £1,900, but not until two months before war broke out in September 1939 did the Ministry take over any real responsibility for financing the work.

Many years later, in 1965, when the American Institute of Aeronautics and Astronautics gave Whittle their Goddard Award, it praised him for 'his imagination, skill, persistence

2 For a fuller account of Bramson's report, written in 1935, see the Royal Aeronautical Society's *Journal* of February 1970.

and courage in pioneering the jet . . . thus revolutionizing military and commercial aviation for all time'. Certainly without these qualities and the enthusiasm of his small group of collaborators the project would have died. Equally it would have proceeded much faster had Whittle been able to afford new parts for his engine to replace those which became worn or damaged in testing. Instead he had to make do and mend, and for three years the project was run on just one experimental engine.

In official circles Whittle had only one important 'believer', Sir Henry Tizard, at that time chairman of the Aeronautical Research Committee. This delightful man was used to the jinx that so often afflicts projects that are demonstrated to visiting VIP's. In January 1940 he watched a perfect run of the Whittle engine on its test-bed and commented at the end: 'A demonstration that does not break down in my presence is a production job.' None the less important technical problems were overcome, including a fundamental discovery that the traditional design of turbine blades was inefficient and took no account of the differing velocity and pressure applied from root to tip of the turbine blade due to centrifugal force. The solution was to change the angle or 'twist' from tip to root of the turbine blade to take account of this. Whittle had observed something that was obvious to him but which had eluded turbine specialists for half a century or more. As he wrote: [3] 'It may seem a very strange thing that specialists on turbine design had overlooked a phenomenon which I had more or less taken for granted. I heard somebody once define a practical man as "one who puts into practice the errors of his forefathers".'

Whittle was assisted in other directions: Firth-Vickers developed a new nickel-chrome alloy, Rex 78, which allowed the turbine blades to operate at the extremely high temperatures required without continual failures; another metal, Nimonic 80 produced by Mond Nickel, was an even more valuable contribution. Then in 1940 Shell Petroleum brought to Whittle's notice a combustion chamber with which they

3. *Jet: the Story of a Pioneer.* Muller, 1953; page 73.

had been experimenting, and this solved his major combustion problems.

Quite how novel a conception the jet was to even high-ranking RAF officers is proved by the visit, in December 1940, to Whittle's test-bed of Sir Hugh (later Lord) Dowding, the famous Battle of Britain commander. Whittle records the episode in his book.[4]

> While the experimental engine was running, I took him round the outside of the test-houses. It was impossible to speak because of the noise. As we stood about three yards away from where the jet nozzle protruded through an aperture in the test-house wall, I pointed to the nozzle, meaning to imply 'That's the "business end" of the engine.' He misunderstood my gesture and, before I could stop him, walked rapidly in the direction indicated. Suddenly a mighty invisible force wrenched open his raincoat and sent him staggering across the concrete—his 'brass hat' rolling away onto the grass.

Sir Hugh recovered himself, apparently unhurt, but 'only those in the Service would really understand what a junior wing-commander feels like when he is responsible for this sort of thing happening to an air-chief marshal. At first it seemed remarkable that he should have escaped so lightly, but the fact was that the jet blast was so powerful that it was almost "solid" and so prevented him from walking right into it. Until that moment I had not realized how deceptively invisible the jet was to a stranger.' Only the cows in the next field many yards distant who warmed themselves in the tail end of the blast derived much pleasure from the incident.

The Air Ministry gave Gloster Aircraft the task of designing and making the airframe to suit the jet. On 5th May 1941 came Whittle's great moment, his reward for thirteen years of persistence, inspiration and much frustration and disappointment. Britain's first jet plane, the Gloster/Whittle E 28/39, took to the air. Even this purely experimental aircraft out-performed the Spitfire, at that time the RAF's main

4. *op cit.*, page 134.

piston-engined fighter. Indeed the performance was better than prediction. The appearance of this hush-hush propeller-less plane on the airfield at Cranwell caused incredulous comment in many a pub and officers' mess. Surely weak war-time beer could not be causing these post-lunch hallucinations?

Progress was greatly speeded when Rolls-Royce took over development and, thanks to Whittle, Britain had jet fighters in service before the end of the war, powered by engines which were a direct development of the Whittle unit. His early engine, the WIX, was also the one sent to the General Electric Company in America in October 1941, with drawings of a later engine and a small team from Power Jets.

Of course Whittle was not the only person to be researching the jet-engine in the thirties, though he was quite unaware of it at the time. As often happens where a common technical problem is perceived in this case the diminishing efficiency of the propeller aircraft at high speeds and altitudes - parallel research was going on in Germany. In 1934 (four years *after* Whittle) a German physicist and aerodynamicist, Hans von Ohain, patented a centrifugal turbo-jet, but did not get it working on the test-bed till several months after Whittle's 'runaway' test of 1937. Though von Ohain did not get his ideas from Whittle he later confided to Whittle that he had had a lot of trouble with the German patent office, who cited the earlier Whittle patent against him when he tried to get a worth-while patent for his own design.[5] Von Ohain's ideas were taken up with more enthusiasm by the German aircraft manufacturer Ernst Heinkel, who was anxious to break into the aero-engine business. However, the first jet aircraft to fly, the Heinkel He 178, was not a success. After a ten-minute flight in August 1939 it flew only two or three more times. No other German jet flew before the Gloster Whittle, which in contrast to the Heinkel completed a planned test programme of ten hours at the end of which the engine was found to be in perfect condition.

5. Sir Frank Whittle, correspondence with the authors, 7th October 1970.

Meanwhile Junkers commenced work on a more ambitious design, an axial compressor jet (as opposed to Whittle's centrifugal compressor), but the engine did not run until 1942. This powered the Messerschmitt Me 262, which went into service in the autumn of 1944.

Even the Junkers engine was a crude device compared with the Whittle. It had 40 per cent higher fuel consumption, shorter life between overhauls and, worst of all, a tendency to stall if the throttle was opened rapidly. The Germans took a chance and put the engine into production before getting the bugs out. This was a major cause of numerous Me 262 crashes. 'Compared with us,' says Dr Stanley Hooker,[6] who developed the war-time Rolls jets, 'the Germans were bloody amateurs. The German engines killed a damn sight more Germans than Allies. They were hell to start and needed a two-stroke engine as a starter motor, which often didn't start itself. Our engines had to pass a proper 150-hour test theirs didn't.' Whittle himself comments: 'Von Ohain is a very likable and modest man and from what he has said to me he certainly does not consider that the Germans were ahead of us.'[7]

Whittle has been criticized for sticking to the centrifugal compressor instead of the slimmer, more streamlined, axial flow compressor which compresses air in the direction of flight, so contributing to the thrust, rather than shooting it out sideways as the centrifugal compressor does. His associate Dr Hooker says:[8]

> Whittle was always well aware of the advantages of the axial flow compressor. We all were, but knew it would take time to develop. In fact it took Rolls-Royce about ten years to develop a satisfactory axial compressor in the Avon. This time-scale was no use in a war. The centrifugal compressor was reliable and robust and all agreed it was the only one possible in the time available. As it was

6 Conversation with the authors, 26th June 1970.
7. Correspondence with the authors, 7th October 1970.
8. Conversation with the authors, 26th June 1970.

we had an effective jet which was in service in the Meteor by 1944.

To Whittle's credit he was also the first to design the turbo-fan or by-pass engine (described in the following section) which is now much in fashion, and his Power Jet design was copied by General Electric in America for the Convair 990.

Whittle's contribution has been well assessed by the industrialist Sir Harold Roxbee Cox, now Lord Kings Norton who, as war-time deputy director of scientific research at the Ministry of Aircraft Production, was intimately associated with Whittle's work. As quoted in Whittle's book, he wrote in 1947: 'It may be said that without Whittle the jet propulsion engine and the other applications of the gas turbine would have come just the same. They would, but they would have come much later. Whittle's work gave this country a technical lead in aircraft gas turbines of at least two years.'

The Government, so parsimonious in its financial aid in the early days of development and indeed at the time it compulsorily nationalized Power Jets in 1944, gave Whittle a £100,000 tax-free award for his invention in 1948. He had by then resigned from the board of Power Jets, disappointed that he was no longer free to design and develop his own engines.

The years of frustration and anxiety had taken their toll: Whittle suffered from a typical nervous complaint, chronic eczema of the ears; further poor health led to his retirement from the RAF, with the rank of air commodore, in the summer of 1948, when he was also knighted.

It is sometimes said that Whittle was a 'loner', not a man to fit readily into a large organization, and no doubt advanced development of the jet required such an organization with its immense resources. 'Yet he gathered together a team of young, inexperienced engineers and trained them so well that today many occupy very high positions. He was only alone because he was thinking years ahead of us ordinary mortals,' comments Hooker.[9] He was denied by financial

9. Correspondence with the authors, November 1970.

stringencies the facilities he merited.' What is remarkable is that for an incredibly small sum of under £100,000 (much of it private money) the first Whittle jet was not only developed but successfully flew. These days the cost of developing an engine can be as high as £150 million. The project would never have been started but for private money. It would never have succeeded but for Whittle. As Sir Harold Roxbee Cox put it:

> It is one thing to have an idea. It is another to have the technical and executive ability to give it flesh. It is still another to have the tenacity of purpose to drive through to success, unshaken in confidence, in the face of discouraging opposition. Whittle, whose name in the annals of engineering comes after those of Watt, Stephenson and Parsons only for reasons of chronology or alphabetical order, had these things.

Though the story of the jet certainly begins with Whittle it does not end with him. Largely because of the lead he gave, Britain has the Western world's only major manufacturer of jet engines outside the United States.

Chapter 25

MR ROLLS AND MR ROYCE

Rolls-Royce for all its financial troubles is still the sign of quality, reliability and engineering excellence. It is—though the cost has been enormous—still a technological leader in new engines.

On 28th March 1968 British hearts leapt with pride following the announcement that Rolls-Royce had crashed into the American market with a £180 million sale of their huge advanced technology RB 211 engine for one of the new generation of jumbo bus-stop jets, the three-jet Lockheed Tri-Star.

Rolls badly needed the big international market if it was to remain in the world league; congratulations were showered upon the firm by government and people. Two and a half years later on 11th November 1970 a startled British public learned that this great firm 'the very name purrs with the pride of British engineering', declared the *Daily Sketch*—had stumbled into the red and needed £60 million of public and City money to bail it out. 'It's like suddenly hearing the Crown Jewels have had to be pawned,' bemoaned the *Sketch* (now itself defunct). The chairman, Sir Denning Pearson, was replaced. Sir David Huddie, the man who masterminded the RB 211 deal, quit his directorship. But worse, much worse, was shortly to follow.

On 4th February 1971 the morning papers, like anxious doctors monitoring the condition of a fast-sinking patient, came out with headlines like 'Crisis Night for Rolls' and underneath was the amazing news—surely it couldn't be true? —that the Cabinet, after bitter argument, was thinking of pulling the rug out and allowing this most famous of British firms to crash. Evening newspaper headlines confirmed the astonishing news: ROLLS-ROYCE GOES BUST. The

RB 211 (the RB stands for the Rolls factory at Barnoldswick in Yorkshire) was the key to the collapse. It was described as 'an albatross bleeding the company to death'. And this was no exaggeration. There had been development delays of almost a year; its much vaunted carbon-fibre turbine blades had proved too vulnerable to bird strikes and a costly back-up programme of titanium blades had to used instead. Development costs had jumped from the original £65 million to £135 million and then up again to £170 million. That wasn't all: there would be a loss of at least £60 million on the manufacture of the first 540 engines because the contract with Lockheed had made only minor provision for inflation. And even that wasn't all. Lockheed, itself in financial trouble, and the airlines (yes, they were in financial trouble too) would assuredly claim compensation for late delivery. Add another £50 million at least and total continuation costs would be approaching £300 million. Yet cancellation with 'running down' costs to sub-contractors plus damages claimed by Lockheed and the airlines could also come to £300 million. Faced with this unenviable 'Heads I lose, tails you win' situation the Government took the somewhat dishonourable but strictly legal course of welshing on the deal and letting Rolls-Royce go bankrupt. It was the only way of renegotiating the RB 211 contract with Lockheed, or, in the event of cancellation, averting huge compensation costs. Not much fun for the shareholders, especially thrifty Rolls workers who had invested for their old age in their own company. Not much fun for the banks (Lloyds and Midland stood to lose as much as £40 million). Not much fun for Lockheed, already itself on the edge of bankruptcy and in need of US Government support. But for the British taxpayer it was an astute move, especially as the essential assets of Rolls-Royce were then taken over by the Government. Rolls-Royce was dead. Long live Rolls-Royce (1971) Ltd—nationalized, of all things, by a Tory government. With numerous airlines and some half of the world's air forces dependent on Rolls equipment, it had to be.

The Tories were criticized for sharp practice, though the

world of commerce has known sharper, and in fairness to the Government it underpinned the RB 211 at a cost of over £1 million a week for the next six months during which there was no guarantee that Lockheed could complete the Tri-Star project. It took weeks to remove the bitterness and suspicion between the British and Lockheed and not till May 1971 was a revised contract provisionally agreed upon. It allowed for a 20 per cent increase on the old price for a set of three engines. Even so, a production loss of about £30 million was expected on the first 555 engines. Then the US Congress had to approve the £100 million Federal loan guarantee necessary to save Lockheed from the threat of bankruptcy.

In a cliff-hanging marathon through the summer of 1971, with 30,000 British jobs at stake, it was not till 2nd August that the US Senate approved the loan guarantee by just one vote, 49 to 48. Four days previously the House of Representatives had approved the same measure by an almost equally slim margin. On 14th September a financing agreement between Lockheed, the airlines, the banks and the US Government was finally signed. Rolls-Royce and its 30,000 threatened workers breathed again.

In hindsight the whole affair spelt numerous lessons to pundits and politicians of every description. Prime Minister Heath remarked sharply: '. . . for too long very much of our apparent prosperity has been based on illusions'. Labour's former Minister of Technology Wedgwood Benn, whose sometimes misplaced enthusiasm helped push Rolls into the original contract, called the bankruptcy 'the greatest betrayal in industrial history'.

Rolls was indicted for the sin of technological pride—meaning that it put time and cost a poor second to perfectionist engineering. In an effort to stay ahead Rolls had attempted to leap-frog into a new generation of turbo-fan or by-pass engines. It had always succeeded in the past, and after years of living off a good deal of cost-plus government work it had never seriously thought of a crippling shortage of money. But the RB 211 was a massive gamble—a sort of

Russian roulette with too many of the revolver chambers loaded. Little provision was made for the unforeseen snags which inevitably occur in advanced designs. Development estimates were excessively squeezed. The firm also capitalized far too large a part of its formidable research and development costs instead of charging them against annual revenue. The device is legitimate when profit will certainly flow in due course from this research and development investment; but financial folly when the profits are only putative.

Others still thought that Rolls was an advanced technology luxury that a medium-sized nation could no longer afford. Certainly one lesson taken to heart by the Government was that this was the last such project the company could undertake on its own. To prevent an American monopoly in aero engines the technical expertise and experience in depth of Rolls would now need to be deployed as part of a European Consortium. Indeed Europe should have been the priority back in 1967 when Rolls had the chance to supply the aero-engines for the European Airbus, in which Hawker-Siddeley already had a substantial airframe stake. But the American prize deluded both Rolls and the effervescent Wedgwood Benn at Min-Tech. In the summer of 1968 the last chance to make the Airbus a substantially British venture with British engines was finally forfeited when the British Government withdrew all support. It was a major strategic blunder, though Hawker-Siddeley sensibly continued its stake in the Airbus as a purely private venture. The Government's withdrawal may have been influenced by the British Aircraft Corporation's plans for a BAC 311 airbus, though it must have been patently obvious that, with the DC 10 and Tri-Star being made in America and the Airbus in Europe, this was one wide-bodied airbus too many. Inevitably the BAC 311 was cancelled, leaving Britain with an inadequate stake in the European Airbus and an uneconomic engine contract for the American project in which losses and development costs will now total £250 million. Nonetheless significant new orders for the Tri-Star in 1974, bringing

the total of firm orders and options to over 200, have greatly brightened the prospects for Lockheed and for Rolls.

Meanwhile, Europe still beckons with other ventures. The company remains a sizable national asset in which the RB 211 will account for only about a fifth of total sales. Rolls-Royce (1971) is the nation's fifth largest exporter. It has many other profitable contracts still to be fulfilled in fields like marine and industrial gas-turbine engines as well as aero-engines. Now the brilliant design team is under the control of sharp-eyed accountants, the future gives ground for quiet optimism and – the financial debacle of 1971 apart – the historic record is still something to be proud of. So we still include Rolls-Royce in our story of British achievement.

In addition to its matchless motor-car it has been a leader in the field of aero-engines since 1915. Today Rolls-Royce jets power thousands of aircraft, some twenty-four different commercial types and over forty types of military aircraft. Customers come from many nations: America, Yugoslavia, Canada, Sweden, Germany, Japan, Italy and France. The company can point to a string of notable firsts. The world's first turbo-prop engine the Trent (a combination of the jet principle with propeller), which first flew as early as 1944; the world's first turbo-prop engine in a civil air-liner, the famous Dart engine which powered the Viscount and has become the workhorse of the air with sales of over £200 million. The world's first turbo-fan or fan-jet, the Conway, which makes use of the by-pass principle. The world's first commercial jet-engine to use air-cooled blades. (Great reductions can be made in bulk and weight by operating at high temperatures. But this requires cooling of turbine blades, a feature first introduced commercially in the Rolls-Royce Conway power plant of VC 10s, and some Boeing 707s and DC 8s in 1960.)

Rolls-Royce is also associated with nuclear submarines, hovercraft, tanks, space rockets, helicopters and multi-fuel engines to power self-propelled guns and armoured personnel carriers. Their advanced research into noise reduction

will make the giant jets of the eighties as 'whisper quiet' as the old turbo-props like the Britannia. The firm has also pioneered the use of new materials like glass-fibre composites for such applications as jet-engine compressor blades and fan blades. Rolls-Royce (1971), which runs the gas-turbine side of the old Rolls, has yearly sales of some £300 million, of which a third goes for export. It employs 63,000 people world-wide, of whom the bulk are in aero-engines. At the end of 1970 the firm had an order book worth over £500 million. A separate company, Rolls-Royce Motors, nows runs the car division at Crewe and the diesels at Shrewsbury. In recent years the famous motor-car accounted for less than 5 per cent of total sales.

In 1966 Rolls took over Bristol Siddeley engines, who make the Olympus 593 for Concorde and the Pegasus for the Harrier Jump-Jet. British aircraft still in high demand by the world's airlines such as the HS 748 turbo-prop commuter jet and the BAC 111 bus-stop jet are both Rolls powered, the first with the ever-dependable Dart and the second with the Spey, a second-generation turbo-fan engine. The Rolls-Royce Bristol/Snecma M 45H turbo-fan is used to power the forty-seater VFW 614, West Germany's first civil jet airliner. Rolls's experience with vertical thrust engines makes it a certain starter in any vertical take-off airliner to be built in the next decade by Britain or a European consortium. Rolls engines also power the Anglo-French Jaguar tactical support and training aircraft and the forthcoming 'swing-wing' Multi-Role Combat Aircraft, of which the RAF, Italian Air Force and Luftwaffe will require around 1,000 from the mid-seventies onwards. This is easily the biggest military aircraft and engine production programme to be seen in Europe since the Second World War. Such is the range of Rolls-Royce's activities. How did it all begin?

Mr Rolls first met Mr Royce at the Midland Hotel, Manchester, some time in May 1904. Their names had an agreeably alliterative ring, and despite their differing backgrounds Rolls and Royce took to each other at once. The Hon, Charles Stewart Rolls, Eton and Cambridge, third son of

Lord Llangattock, was a sportsman and a skilful and daring motorist. He also had a degree in maths and applied science, so he was as well versed in the technical aspects of motoring as he was in racing and records. By contrast Henry Royce, the son of a small miller in Lincolnshire, had two years' formal schooling before starting work as a telegraph boy at the age of ten. After attending night classes at a technical school he was apprenticed to a railway workshop in Peterborough, did a spell of engineering in Leeds and then set up as an electrical equipment manufacturer in Manchester. The firm began with only £70 raised from savings. Rolls and Royce had one great thing in common. Both insisted on the best in everything—on engineering excellence. Before the get-together Rolls, who had a car dealership, had concentrated mainly on foreign imports because he considered there were no British cars good enough for him to sell. For his part Royce had refused to lower standards when cheap foreign imports threatened his electrical business, which made lamps, dynamos, motors and cranes. Instead he turned to making cars. Appalled by the design faults of the French car he was driving, Royce dismantled it, put it together again and then designed a much better vehicle of his own. Hand-picked mechanics assisted by Royce himself, who missed sleep and meals, built a two-seater 10-hp car to the most exacting precision standards.

These were still the pioneering days of haphazard, unreliable motoring. But when the first Royce car was rolled out on 1st April 1904, to the astonishment of all present, save Royce himself, it purred almost noiselessly to life at the first turn of the handle thanks largely to a new electrical system devised by Royce. News of this superb vehicle soon reached the ears of the fastidious Rolls. He heard about it from a pioneer motorist, Henry Edmunds, who had just become a shareholder in Royce Limited. Edmunds arranged the meeting in Manchester, where Rolls agreed to sell Royce's entire vehicle output.

Rolls-Royce, officially linked as a business at Christmas 1904, was one of many new mergers to appear that year. The

other names are long forgotten—the Ryknield from Burton or the Rothwell from Oldham—but Rolls-Royce were destined to live. Royce's Silver Ghost of 1906, a 40–50 hp six-cylinder car, he believed to be his finest creation and it earned for the company the title of 'the best car in the world'. Kings, princes, maharajahs -and even Bolsheviks such as Lenin—eventually drove behind the famous RR symbol. But for Charles Rolls time was running out. In addition to his TT racing he had turned to ballooning and then to powered flight. He was the first Englishman to fly across the Channel in a heavier-than-air machine. Soon after he became the first Englishman to die in a plane. On 12th July 1910 his plane crashed at a Bournemouth flying meeting. He was only thirty-three.

About the same time Royce fell seriously ill and thereafter attended only once at the new factory at Derby, his time being spent on the south coast or in France; not that his genius was much dimmed by absence or illness. He communicated with Derby by means of short, pithy notes and a small hand-picked group of designers who worked under his direct guidance. When war broke out he designed and made the Eagle, a liquid-cooled engine (he hated air-cooled designs) which powered over half the Allied aircraft in the First World War as well as Alcock and Brown's transatlantic Vickers Vimy. When the Air Ministry decided to compete in the international air-races for the Schneider Trophy in the late twenties Royce was asked to design a racing engine. It took him six months to build and develop the 'R' engine, a remarkable power-pack for those times; it produced 1,900 hp for a weight of only 1,350 lb. and powered the winning Supermarine seaplane. The later 'R' engine developed 2,530 hp and pushed the world speed record to 407·5 mph. The bearded Royce, by now a baronet, had become a very sick man; he listened to the race in bed trying to guess the result by the sound of the engines. He died at the age of seventy in 1933, having spent his last day on earth making designs for a new shock-absorber.

From the Schneider Trophy engine was developed the

famous Rolls-Royce Merlin, named after the bird of prey, as was the custom with Rolls-Royce piston engines. It began as the PV 12 (PV for private venture) and was Royce's last design He never lived to see it run or to become the greatest piston aero-engine of all time. Due to the V-12 formation of its cylinders (they were in two banks of six) the Merlin had a very small frontal area in relation to its output. R. J. Mitchell of Vickers Supermarine, who had designed the Schneider Trophy-winning seaplanes, incorporated the Merlin's streamlined shape into the design of his Spitfire before his tragically early death in 1937. Sydney Camm used the engine in his Hurricane, the other great Battle of Britain fighter. The Merlin was the most widely used engine of the Second World War, just as the Eagle had been in the first. It was used in the bulk of RAF heavy bombers like the Lancaster, also in the Mosquito fighter-bomber. Produced under licence by Packard in America, it became the standard power plant of the most notable American fighter of the war, the P 51 Mustang. Like all great engines the durable and flexible Merlin proved capable of constant up-grading of power without any basic change in design. By the end of the war it was twelve years old, but still a leading design. The original engine developed less than 1,000 hp at take-off; the Merlin 130 produced 2,030 hp. Much of the credit for these improvements must go to a young mathematician and aeronautics engineer Stanley Hooker, who joined Rolls in 1938 as head of the Supercharger Section.

Successive developments of the Merlin boosted the top speed of the Spitfire from 355 mph to 414 mph, doubled the rate of climb and added 10,000 feet to its operational altitude. The real innovation was a two-speed, two-stage supercharger, i.e. a supercharger supercharging a second supercharger. 'No other aero-engine had this feature and it doubled the power of the Merlin at 30,000 feet,' said Hooker. 'At a time when an extra 5 mph and 1,000 feet meant life for our pilots and death to the Luftwaffe this was highly significant.'

Hooker, a genial pipe-puffing man whose easygoing man-

ner hides a sharp mind, later headed the design teams of the Concorde's Olympus engine, the Harrier's Pegasus and the widely used Orpheus turbojets. But perhaps in retrospect his finest hour was in 1941 when he introduced Frank Whittle to the then Rolls-Royce chairman Lord Hives. In its way it was a meeting as historic and significant as that between Rolls and Royce some forty years previously: for this was how the company's activity in jet-engines began and it was the vital ingredient which turned Whittle's brilliant invention into a production reality. Hooker, having met Whittle the previous year, was already deeply interested in jet propulsion. Hooker recalls: 'I persuaded Lord Hives to come down to Whittle's works, an old iron foundry at Ladywood. Hives had inquired the power of the jet and I told him it gave about 1,000 lb thrust Hives looked dubious: "What does that mean? – It wouldn't pull the skin off a rice pudding, would it?" But when we worked it out we discovered it represented about the same power as the Merlin engine at 300 mph. With 75 per cent propeller efficiency a 1-lb. thrust equalled 1 hp. One could visibly see Hives jump to attention He arranged a visit to Whittle with me for the following Sunday afternoon. That was in August 1941.'

Meanwhile Whittle was having trouble with the development of his engine; so too was the Rover Car Company, who were co-operating with Whittle against a background of increasing altercation. Rover's chairman, Spencer Wilkes, came to Hives and pleaded: 'Lend me an engineer who understands centrifugal compressors.' So Hooker went to the two Rover plants at Barnoldswick and Clitheroe to assist Rover's. Then one winter evening towards the end of 1942 Hives decided to force the pace with Wilkes. Hooker relates: 'The three of us had dinner at the old Swan and Royal at Clitheroe, a pleasant enough meal, and at the end of it Lord Hives announced: "I want this turbine job for Rolls-Royce. Look here, I'll give you the tank engine factory at Nottingham. In exchange you give me everything at Barnoldswick and Clitheroe." ' And so almost casually the firms exchanged

factories and Hooker was detailed to organize staff and development.

By the time the 'swap' became official in April 1943 Hooker was already developing Whittle's Welland engine to service standard for the Meteor and from this came the first purely Rolls-Royce jet-engine, the Derwent. This was the power plant of the later Meteors. In 1944 the Nene was also designed and developed at Barnoldswick. 'Whittle continued to make valuable technical contributions, but it was obviously impossible for him to compete with our large resources. For instance, he didn't even have a compressor test-rig,' recalls Hooker. The Meteor was the first jet in allied service in 1944 and, after the war, in 1946 the Meteor (with Derwent V engines each of 3,500 lb. thrust) broke the world's speed record at 606 mph.

The following year Hooker made the technical arrangements for Pratt & Whitney to make the Nene under licence. In all, some 33,000 were made in America. The early Whittle had already been given to America to power the first American jet aircraft—it flew in 1942—the twin-engined Bell XP-59A. In 1949 he joined Bristol aero-engines and did not return to the Rolls-Royce fold till Bristol's were taken over by Rolls in 1966. As head of the design team for the Concorde's engines he has firm views on that project: 'It will earn this country £2,000 million in foreign exchange. The most disastrous thing any government can do is to say we won't buy British any more and that we'll buy American. We shall get back the Concorde development costs in terms of foreign exchange that can't be earned in any other way. This aeroplane will go on for twenty years.'

The next step in engine development which will greatly reduce take-off and approach noise is the more widespread use of a turbo-fan or by-pass engine in place of turbojets such as the Avon or Olympus. The by-pass engine is one in which a large mass of the air taken in by-passes the gas producer or core engine where combustion takes place. In an engine like the RB211 it is in effect a three-stage compressor. The fan, very large, is a low-pressure compressor, followed

by an intermediate-pressure compressor followed by a high-pressure compressor. This makes possible a very high compression ratio of 27:1 with consequent increase in thermal efficiency. The engine also has a very high (5 : 1) by-pass ratio (the ratio of the mass of cold air which by-passes the gas producer to the air mass actually passing through the gas producer). The high by-pass ratio lowers the terminal jet velocity, which ideally should be near the cruising speed of the aircraft, and this means better propulsive efficiency as well as less noise.

Where the RB 211 scores over competitors is that it has three shafts—one driving the fan, another the intermediate compressor and another the high-pressure compressor. This makes it possible for each of the compressors to bé run at optimum speed. For the difficulty of running a three-stage compressor without independent driving shafts is this: the fan (first stage of the compressor) has a large diameter, the intermediate compressor a smaller one and the high-pressure compressor a smaller diameter yet again. But the tips of all three should for ideal efficiency speed round transonically (around the speed of sound). Plainly, because of their varying diameters, this is impossible if all or any two are driven by the same shaft. By having three independent shafts each compressor can be driven at the optimum speed. The engineering problems in designing concentric shafts to drive independent compressors in series were considerable indeed. The gain in performance, however, is dramatic. Compared with the Avon, which powered the Comet and the Caravelle, the RB 211 has half the specific fuel consumption and specific weight.

The RB 211, which powers the Tri-Star, develops 42,000 lb. thrust. It is cheaper to run and noticeably quieter and more smoke-free than any of its rivals. Even this advanced engine can and will be improved. It could be developed to give 55,000 lb. or more. There will be better metals making for higher operating temperatures; better methods of cooling turbine blades; improved aerodynamics leading to still more

efficient compressors and turbines. In the van of all these developments will be RR. That familiar little badge on the side of an engine is still the most comforting sign that any air traveller, especially the nervous one, can hope to see.

Chapter 26

FIRST OF THE NEW— THE JUMP-JET STORY

At 10.32 on the morning of 5th May 1969, amidst a cloud of dust from a disused coalyard near the grimy Victorian pile of St Pancras Station, an RAF Hawker Harrier jump-jet took off like a bird of the future, bound for New York. Less than six hours later the Harrier, piloted by Squadron-Leader Tom Lecky-Thompson, snaked its way upriver to land in the heart of Manhattan and caught thousands of New Yorkers open-mouthed. None of them had ever seen anything like it before —a jet aircraft landing on a helicopter pad. The squadron-leader, a winning competitor in the *Daily Mail* Transatlantic Air Race, finally made it from the top of the Post Office tower to top of the Empire State Building in 6 hours 11 minutes and 55 seconds. His city-centre to city-centre flying-time was less than six hours. Though London to New York direct by jump-jet is not yet a realizable proposition in commercial terms, the Harrier's record-breaking flight to New York was an eye-opener to United States service chiefs, as one of them, Vice-Admiral T. F. Connolly, was later to testify to a Congressional committee on Appropriations. It helped to clinch the purchase of the Harriers by the American Marines who now have orders for 100 Harriers in the pipeline.

The British Harrier is a significant landmark in aviation history. For more than a decade world aircraft designers struggled with the problem of Vertical Take Off and Landing (VTOL). What was needed was a plane with the same take-off and landing capability as the helicopter but considerably more speed. Some attempts were wretched failures, others were interesting prototypes and not much more. Only one jump-jet aircraft went into production and service be-

fore the sixties ended, and that was the Hawker-Siddeley Harrier.

In April 1969 the RAF's No. 1 Squadron became the first operational VTOL squadron in the world. The plane can fly sideways at 60 knots, backwards at 25 knots and forwards transonically (i.e. on the fringes of supersonic flight). 'It's extremely easy to fly,' says Hawker's former chief test pilot Bill Bedford, 'but you have to observe certain basic rules so as to avoid side-slip otherwise you have a tiger by the tail.' Until the advent of the two-seater Harrier in mid 1970, a pilot's first solo was also his first flight. As it happens the Harrier in service has had a good safety record, a tribute to the basic rightness of its design.

Militarily VTOL is a bigger revolution in design and still more in tactics than the advent of the metal monoplane fighter in the thirties. It is the First of the New. For the jump-jet needs no runways. Anyone driving through the Northamptonshire countryside in 1970 might have caught a glimpse of a jet-fighter coming down in the middle of a wheatfield or disappearing into the heart of a wood. The RAF was practising the dispersal tactics which can protect a jump-jet from surprise attack. Jump-jet squadrons can be dispersed to pre-selected hiding spots where they can also be refuelled and re-armed. The jump-jet can also be stationed in safety immediately behind ground forces so as to provide close support ground attack.

When the RAF's order for the ill-fated American F 1-11 was cancelled the Air Force soon discovered that the Harrier could do most of the things that the F1-11 could and more besides. It is not only safer in defence, but its concealment potential means it is more effective in springing a surprise attack. Herbie Coleman of the influential United States *Aviation Week* calls the Harrier 'a battlefield airplane that will revolutionize warfare. The United States had six or more similar projects. But the Harrier really works.'

The story of the Harrier really goes back to 1956, when Stanley Hooker, then of Bristol (now Rolls-Royce) Aero-Engines, began to interest himself in a NATO project for

VTO being worked on in Paris. A Frenchman, the late Michel Wibault, had suggested to Bristol's a basic engine layout which incorporated the important principle of a jet-nozzle that could be rotated—to provide either vertical thrust for take-off or a horizontal thrust for level flight. Though Wibault's precise plans were too heavy and cumbersome to be workable the idea excited Hooker, who began his own work on an engine with a rotating nozzle—or, as the jargon has it, a 'vectored thrust'.

The next chapter in the story belongs to the late Sir Sydney Camm, the man who designed the Hurricane fighter, which did even more than the Spitfire to save the country in the Battle of Britain. It was the first and the most versatile if not the speediest of the new generation of all-metal monoplane fighters. To Camm and the Hawker Aircraft management goes much of the credit that there were enough Hurricanes to fight the battle of 1940. In 1957, after hearing about the VTO project at the Paris Air Show, Camm had grasped the immense military implications of the jump-jet. Stanley Hooker recalls: 'Camm sent me a characteristically terse letter: "Dear Hooker, What are you doing about VTO? Yours, Sydney Camm." Uncertain how to take the letter I did nothing very much. Some months later there was a somewhat irate call from Camm: "Why haven't you been to see me? Come on up. I'm going to design an aeroplane round your engine." ' And so he did.

Around Hooker's weird-looking engine contraption, a four-mouthed jet comprising two rotating nozzles on each side, Camm sketched the P 1127, the Harrier's immediate and quite recognizable antecedent In contrast to such VTO projects as Rolls-Royce's bizarre-looking flying bedstead of the early fifties, the P 1127 was a practical proposition from the start. Camm persuaded his firm, Hawker's, to start the plane as a private venture, and not until 1959 did a hesitant Government back an order for two prototypes.

The first 'flights' were made in 1960 with the jump-jet tethered to the ground. Bill Bedford, who was nursing a broken ankle from a car smash, recalls with amusement that

the RAF's central medical board were reluctant to give him a fitness certificate but finally gave him a rating: 'Entitled fit, civil test pilot, tethered hovering only.' He reckons he is the only test pilot ever to be licensed for 'tethered flight only'. It took several months before the P 1127 was released from her tethers, by which time Bedford's ankle had recovered.

The final transition flights from vertical take-off to level flight were made in September 1961. Soon afterwards the intrepid Bedford had to use his ejector seat to bale out when a structural failure in one of the nozzles caused his jump-jet to crash. An exhaust nozzle of fibre-glass had torn off. It was replaced by a steel design and gave no further trouble. The accident occurred near the naval air station at Yeovilton. After ejecting Bedford landed feet first into a sticky ploughed field. He was picked up in the admiral's helicopter 'barge' which had thick-pile carpets. 'I remember looking at my muddy boots and thinking: "God, I hope I don't make a mess of the admiral's carpet." Such are the strange thoughts you often have in moments of stress.'

At the Paris Air Show in 1963 there was another scare when Bedford made an unusually heavy landing—so heavy in fact that there was a loud bang and bits and pieces of the aircraft, including most of the undercarriage, scattered themselves all over the tarmac. Bedford, a very cool customer, emerged shaken but unscathed to comment with characteristic phlegm: 'All aeroplanes on development must have incidents.' The cause of the accident was trivial: a speck of dust had momentarily lodged in a valve, which stopped the nozzles from swivelling into the correct position. A metal filter on the valve proved sufficient to prevent a repetition. 'One doesn't mind these problems so much on one's own doorstep, but it's embarrassing when it happens in public. However, the result of all such incidents is that you end up with a safer plane.'

A more serious blow than the Paris crash was the decision of the newly elected Labour Government to cancel a fully supersonic version of the jump-jet, the P 1154, in 1965. When Sydney Camm collapsed and died on a golf-course in

1966 it seemed as if the Harrier might be headed for the scrap-heap. Bill Bedford, who by the end of 1967 had given up test piloting to become Harrier's sales manager, travelled the world wearily, to be met by the inevitable query: 'Why hasn't the RAF bought it?' In the end the RAF bought ninety planes with a gratifying effect on world sales.

More than twenty countries are now actively interested in the Harrier as well as nine of the world's navies. The fly-away price of the typical Harrier is about £900,000, with much more coming in from the sale of spares. 'As service chiefs all over the world realize what a complete re-think the Harrier will bring in military tactics and strategy we can look to world sales of perhaps 1,000 aircraft,' says Bedford. 'But we shall need the right governmental support, such as the long-term credit guarantees and pilot-training facilities that the French offer to their aircraft manufacturers when they are exporting.' Even though some of the Harriers may be made under licence abroad, Hawker's still get a substantial licensing fee.

The Harrier is powered by a Pegasus 6 Vectored-Thrust turbo-fan developing 19,000 lb. thrust, though a later version, the Pegasus 11, develops 21,000 lb. The Pegasus is the world's first operational lift/cruise engine. At take-off the four nozzles, mechanically linked together, can be slowly vectored (rotated) from vertical to horizontal as the plane accelerates and makes the transition from vertical into level flight. If a small runway is available the aircraft, by using short take-off (STOL) can become airborne with a considerably increased payload. And of landing Bill Bedford declares: 'It's even easier than an ordinary plane. You just yawn and pull a handle back.'

The Harrier's success is now assured, but the military uses of jump-jets are but a part of the story. V/STOL will in time have an even wider application for civilian use. By plane from London to Paris now takes as long, city centre to city centre, as it did forty years ago, so the swift potential of the jet is entirely lost. The scope for a VTO airbus, using verti-ports in or near city centres, is enormous. The 600

mph VTO airbus could make effective time-savings for journeys up to 1,000 miles. A VTOL transport cuts out the need for expensive miles of concrete runway. A verti-port can handle the same volume of traffic as a conventional airport in only a fraction of the space. Since short-haul, which is ideal for VTOL, forms the bulk of passenger movements, the wider use of vertical take-off will stop proliferation of big and costly new airports. Hawker-Siddeley's Ian Chichester-Miles says: 'We have completed studies which suggest that Western Europe's airport-building requirements, currently scheduled at £2,500 million till the middle of the eighties, can be cut by at least £600 million.' Moreover the noise nuisance of jets landing in or near the heart of cities would be less than that currently made by conventional aircraft overflying London or Paris or New York. 'Conventional jets take off and more particularly land at a very shallow angle of flight. On the approach they are probably flying twenty miles at less than 5,000 feet. They leave an enormous sound footprint, much of it over built-up areas,' explains Chichester-Miles. 'By contrast a jump-jet goes more or less straight up and down. Consequently its noise can be confined to a narrow cone.' Jump-jet transports will be less objectionable for another reason: they will have one set of engines for level flight, another set of special lift-engines for take-off and landing. Special lift-engines can operate at low jet velocities. Noise depends on jet velocity so this means greatly reduced noise. A VTOL at a quarter of a mile distance will make no more noise than a jumbo a mile away.

The next decade will see a big struggle among the world's manufacturers for a share of the civil jump-jet market. In this struggle the vast experience of Hawker-Siddeley (possibly with a European partner) puts the British firm in an unrivalled position.

Chapter 27

CONCORDE

'This is the fringe of space where time runs backwards. The sky is a deeper blue than any airline passenger has seen it before – half way to the darkness that astronauts know.' Such were some of the impressions of supersonic flight at Mach 2 or 1,300 mph as the world's press sampled Concorde for the first time in 1971. Time does indeed run backwards. The traveller from London to New York can board Concorde at 10 a.m. and land in New York soon after 8 a.m.

The Concorde traveller from Sydney to San Francisco, crossing the international date-line, can play an even more spectacular time trick. If he leaves Sydney at 9 p.m., say, on a Monday he will arrive on the west coast of America still on Monday, but at fifteen minutes past noon, a time saving of almost eight hours on the fastest subsonic jet-liner. The man who flies from Sydney to London by Concorde will do the journey sixteen hours more quickly than by subsonic jet. Boarding Concorde in time for one o'clock lunch at Sydney, he could be sitting down to dinner in his hotel in Central London by 8.30 p.m. Concorde, in truth, is a globe-shrinker. Some may find it absurd that anyone should want to reduce the world to these minute proportions, but speed is and always has been a highly marketable commodity. One has only to look at the advent of the transatlantic jet-liner in 1958 to realize this. By 1960 airlines who had invested heavily in long-range piston aircraft and even turbo-props found that they had to phase them out of service rapidly. Traffic growth increased phenomenally by some 15 20 per cent per annum throughout the 1960s. Speed not only sells, it also increases profits.

Concorde has achieved all its performance targets with a less than 1 per cent error and in some cases, notably in the

important transonic and supersonic cruise conditions, it has performed better than predicted. Its makers promised a plane that could do the crucial transatlantic run from Paris to New York (the 'uphill' run because of generally adverse winds) with a payload of 20,000 lb. (say 102 passengers). The first production Concorde will exceed that. It is also, for all its technical complexity, pleasing to fly and eminently serviceable - 'the engines run like sewing machines'. Nor are they significantly more noisy on take-off or approach than those of a 707 or DC 8. The engine of the first production Concorde will be quieter still with a new type of 'spade' silencer and a special annular combustion chamber with vaporizing burners which will increase burning efficiency and so eliminate all smoke problems.

Supersonic boom is a larger problem. It is now accepted that Concorde will not be able to overfly most land areas supersonically because of the boom effect. An important exception is the Soviet Union where Russia's Tupolev-144 (nicknamed 'Concorde-ski') will be allowed to fly supersonically should it overcome the problems that followed the unhappy crash at the Paris Air Show in 1973. What goes for Concorde-ski must go for Concorde. This made Japan Air Lines an obvious customer because it would have the same supersonic freedom for its Concordes on the Tokyo Moscow flights. Pat Burgess, the tall, tough Yorkshireman and former RAF squadron-leader who leads the joint Anglo-French sales team sees the Pacific, where there are no boom problems, as one of the major air transport growth areas. The British Aircraft Corporation is confident that the appeal of Concorde, once it is in service in 1975, will open up a substantial market of over 100 aircraft. Burgess adds: 'I look forward to a stretched and improved Concorde selling well into the eighties and possibly until the year 2000.' The current and at the moment of writing the indefinite shelving of the over-ambitious American SST project simply adds strength to Concorde's prospects.

Other environmental hazards advanced against Concorde turn out to have been largely spurious. One theory put for-

ward in America by Professor Harold Johnston of the University of California that nitric oxides in the exhausts of supersonic transports might lead to a serious reduction of the ozone layer protecting the earth from harmful forms of light, turns out to have been based on an estimate of emissions that is ten times too high. Rolls-Royce estimates show that 500 SSTs operating seven hours a day would add less than 100,000, rather than 1,000,000, tons of nitric oxides a year to the atmosphere. In other words, there will still be plenty of ozone left, and in any case four-fifths of the protective absorption takes place at levels higher than the lower stratosphere where SSTs will cruise—along with many more military aircraft already doing so. Ground effect is negligible and infinitely less than exhaust from aircraft (not to mention cars and trucks) at ground level.

Professor Alan Williams has shown that Concorde with 90% of its seats occupied will average 27 passenger miles to the gallon—as good as a medium-size car with one person. The QE2 though always full averages only 12 passenger miles a gallon. So there is no doubt who scores in terms of total energy conservation and pollution.[1]

Burgess is sceptical of 'Concorde-ski's' chances of breaking into the Western market on any substantial scale. For one thing, the Russians are still nowhere near being able to discuss selling price, performance guarantees and conditions of after-sales service. 'In every major Western country,' he says, 'the aircraft manufacturer must bare his soul to the Air Regulation Board or its equivalent, if he wants to get a certificate of airworthiness. But so far the Russians have always been reluctant to supply the vast amount of technical data required. In addition, to sell any sort of plane in the West, you require a massive support policy, with instant availability of spares plus engineers in the field, preferably those who speak your language. As an airline operator do you invest in an aircraft knowing that spares could be cut off for political reasons?'

Now that technical success is assured, economics has be-

1. *The Times*, January 5, 1974.

come the key to Concorde sales. It carries 104 passengers in an all-first-class layout or up to 130 all tourist instead of the conventional jet's 170 and burns a lot more fuel, so that the energy crisis has dealt a heavy blow to its economics. But it can also make two return trips across the Atlantic each day instead of one. The net effect is that Concorde fares would need to be about 20% higher than first-class fares on a subsonic. But again and again the history of aviation has shown that speed is a highly marketable commodity and people are prepared to pay more for it. A sample of 239[2] businessmen in the U.S. taken in 1973 concludes that the majority who habitually travel first class would opt for Concorde and would make more journeys than at present, despite the supersonic surcharge A large portion of subsonic first-class travel would be creamed off particularly on Transatlantic routes, hence the opposition to Concorde of those American airlines with overcapacity on their current fleets.

The least satisfactory side of the Concorde project has been the cost escalation. The total research and development cost to be shared equally between Britain and France had jumped from an estimated £150 million in 1962 to £885 million by mid 1971 and was expected to exceed £1,100 million before the programme was completed.

Inflation has been the cause of a third of this, design changes and modifications have caused the remainder. Apart from the stretching of Concorde to seat 130 plus instead of the original 100, most of the modifications have been the inevitable ones associated with an advanced design. The British share of research and development is the equivalent of over £10 a head for every man, woman and child in the country.

Tory Aviation Minister Julian Amery optimistically informed the House at the time of the Anglo-French agreement in 1962 that the British share of development would be only £85 million, which would include tooling up for production. By 1964 this figure had jumped to £140 million and

2. Concorde and the U.S. Businessman (Market Facts— New York Inc.)

the newly elected Labour Government did its best to unscramble Concorde. It proved almost impossible to do so; the Anglo-French agreement had been registered by clever Mr Amery with the International Court of Justice at The Hague. A unilateral cancellation would have rendered Britain liable to damages in excess of the cost—as it was then calculated—of continuing. So Concorde went on, to a mounting barrage of criticism, much of it alas quite hopelessly ill informed. On any sensible estimate Concorde had passed the point of no return *politically* by 1964. Gloomy critics then hoped Concorde would bury itself for technical reasons by failing to perform to specification. *The Economist*'s Mary Goldring declared in 1968: Someone must call the bluff; the Concorde supersonic airliner will not be built. Alas for the critics. As the chairman of BAC's Commercial Aircraft Division Geoffrey Knight put it: 'From the point of view of the chaps who want to cancel, it is rotten bad luck that the plane does all the things we said it would.'

By April 1974, according to the British Aircraft Corporation's figures, the Government was faced with the choice of spending at least £80 million on cancellation fees (with the added social and economic costs to the country of several thousands of unemployed) or spending another £115 million on building 16 Concordes. Of these five had already been sold to British Airways and four to Air France.

Even though the taxpayer will not get his research and development costs back directly, the country as a whole will benefit in many ways from the technological 'spin-off'. More knowledge has been gained not just about supersonic flight, but about a whole range of fuels, braking control systems, navigational aids, tyres and metals and materials generally. The rubber used to seal Concorde's windows against heat and pressure has also been used to make a more efficient seal on incubators. The new light alloy AU2GN used in the Concorde fuselage has useful applications outside aerospace.

The existence of a firm like BAC building the Concorde improves standards and knowledge of new techniques among sub-contractors. About 19 per cent of Concorde contractors

found some of their products were improved by their work on the project, 31 per cent found they could manufacture to more stringent technical specifications.[3] Advanced technology acts not only as a stimulus but as a national showcase, and because of Concorde, British electronic and avionics firms have been able to break into new markets abroad. 'Spin-off' benefits are not all directly quantifiable, but they exist.

Perhaps most important of all, Concorde has been a lesson in international project management. Despite occasional sniping by both sides this first really large exercise in Anglo-French aviation co-operation has worked well, even though one centre of research and production is at Toulouse, south-west France, and the other is 800 miles away at Filton, Bristol. From the shop floor upwards, the project has been good for morale. As Reg Matthews, who directs assembly and manufacture at BAC's Filton factory, put it: 'When we make a certain component that is going to France there's a sort of honour about it and we make damn sure that it fits. The prototype just fitted together like a Meccano set.' There had been co-operation on the engine side between Bristol's and Gnome et Rhône as early as the twenties, and in the late fifties Sir George Edwards by a wise piece of foresight sub-contracted tail-plane assembly of the VC 10 to Sud Aviation (later renamed the Société Nationale Industrielle Aerospatiale) who are now the airframe partners on the Concorde.

Aerospatiale are making the entire centre fuselage and wings as well as the landing gear, while BAC are responsible for the front part of the fuselage with its droop-snoot, the engine nacelles and engine air intake, the rear fuselage, fin and rudder. This gives Aerospatiale 60 per cent and BAC 40 per cent of the airframe. With the engines the proportions are reversed. The French engine partners are SNECMA (40 per cent) who have responsibility for the entire exhaust system, but Concorde's four Olympus 593 engines were de-

3. *Aspects of Spin-Off.* Centre for the Study of Industrial Innovation, 1971.

signed and manufactured by Bristol Siddeley (now part of Rolls-Royce).

The contrasting temperaments of British and French have also worked well in a complementary fashion. French élan and drive, plus an almost emotional commitment for having things neatly and precisely spelled out, have been matched by the British genius for compromise and the determination to find a common-sense solution. The French industry, broken by the war, bounced back especially after the success of the British-engined Caravelle, but it lacked engine know-how and the experience of the larger British industry.

The extra cost of a joint project with the need for a rather top-heavy bureaucracy of committees (six in all: a joint directing committee, a joint management board, two airframe committees and two engine committees) is thought by some to have added as much as a third to costs. But the cross-checking and double-checking, even if it has delayed decision-taking, has produced a first-class, bug-free aircraft.

Undoubtedly the basic design concept has proved fundamentally sound. The more complicated and sophisticated American design for a Mach 2·7 SST (almost three times the speed of sound) which should have been in service by the seventies was shelved by Boeing, the company that won the contract. This was because of the insuperable difficulties connected with its variable geometry swing-wing design and the heat generated at its projected cruising speed (surface temperature rises to 300° C. compared with only around 120° C. in Concorde). Instead of aluminium, which could not stand the heat, expensive-to-work titanium and stainless steel would have had to be used. Unlike Concorde, which is more an evolutionary design, this was revolutionary. Whichever way the Boeing engineers did their sums, and they put in 500,000 man-hours and 80,000 hours on computers, the swing-wing with its complex hydraulic system came out too heavy. They wound up with a purely paper aeroplane which would have weighed 750,000 lb. and had no pay-load at all. It would have been the biggest white elephant in aero-history (and there have been a few of those!). Having

abandoned swing-wing in December 1968 Boeing switched to a delta wing configuration like Concorde's, and this was subsequently buried by the United States Congress. Dr A. E. Russell, Bristol Aeroplane's design chief and the man who had most consistently pressed for a Mach 2·2 SST in its original phase, had been proved abundantly right. Bristol's had built an experimental Mach 3 fighter, the Bristol Type 188, and their experience had convinced them that the heat barrier was a much more intractable problem than the sound barrier. In any event the time advantage of a Mach 2·7 SST compared with Mach 2 on the North Atlantic run, after allowing for build up to top speed and decelerating, is only a piffling eleven minutes.

Concorde itself, looking like a giant paper dart, is exactly 204 feet long in the production version (prototypes 001 and 002 were 20 feet shorter) Because of heat when it hits Mach 2·2 or 1,430 mph Concorde will 'grow' about two inches. This stretch will be maintained for about two hours over the Atlantic. But as the aircraft gradually descends it will cool and contract to finish up again at exactly 204 feet. This is about 50 feet longer than a 707 but 30 feet shorter than a Jumbo. Because of the dart-like profile the wing-span is only 83 feet 10 inches, less than half the Jumbo's.

Concorde weighs some 385,000 lb. fully laden, of which just over half is fuel. Each of the four Olympus 593 MK 602 engines produces 38,050 lb. smoke-free thrust. A key feature of engine performance is Concorde's variable geometry air intake system. At subsonic speeds the engine needs maximum airflow, but at supersonic speeds the air entering the intakes would choke the engine unless the airflow is reduced in speed to about 60 per cent of the speed of sound. A highly sophisticated system of ramps, valves and doors is employed to induce shock waves which slow the air flow and increase pressure. Controlled in flight by computers, the VG intakes move automatically to give an intake appropriate to the speed of the aircraft. But it is not a delicate system. In one test frozen chickens were fired into the engine to gauge the effect of collision with birds.

Concorde's 100 plus passengers will sit four abreast in a 115-foot-long cabin with a central aisle, which is 8 feet 7½ inches wide. Every seat will have either a window or an aisle. The former Pan American president Majeeb Halaby who, because of his airline's awkward financial plight, emerged as one of Concorde's more testy critics, called the plane 'old-fashioned because of its construction, back to the tube, you might say, from the living-room'. In fact many passengers given the choice prefer the intimacy of the smaller jet to the oppressive sense of moving with a teeming shuffling crowd which exists in the Jumbo. Concorde's air conditioning must insulate the passengers from a surface temperature at supersonic speeds of 120° C. round the fuselage, but subsonically at height the surface could be as little as minus 60° C. There are four systems of air conditioning to provide back-up insurance.

The radiation risk at maximum cruising height of 60,000 feet on the fringes of the atmosphere can be easily countered. Special instruments will monitor radiation levels—both instantaneous and the build-up effect—and should these prove too high the Concorde will simply drop to 40,000 feet and subsonic speeds, at which the range will remain the same although, of course, the flight will take longer. But this is likely to be necessary only about once a year in the life of a plane.

For better vision on take-off, landing and taxi-ing the nose of the plane tilts down. But for a better aerodynamic shape in flight the droop-snoot comes up at transonic speeds (crossing the sound barrier, which takes place at around 30,000 feet on the way up). At Mach 0·93 the streamlined protective visor is raised to prevent the excess heat on the wind shield (nose temperature goes up to 150° C.) from being passed back to the crew. But the primary role of the visor is streamlining. The prototypes had a metal visor, but now they are transparent. Even at Mach 2 at 60,000 feet, where the air space is not exactly crowded, the pilot still likes to look out to see where he is going.

'Going through the so-called sound-barrier is just a num-

ber on a clock as far as this thing is concerned,' says Britain's Concorde test pilot Brian 'Trubby' Trubshaw.

Concorde will be the most thoroughly tested plane in the world when it goes into service in 1975. When the first passengers are told to fasten their seat belts the seven aircraft in the test programme will have flown 4,000 hours.

Chapter 28

'SIR HOVER'

The hovercraft has been called travelling's biggest breakthrough since the wheel. Just as the first man to think of the wheel can have had little conception of the million and one uses to which it could be put, likewise Christopher Cockerell did not dream of all that he was starting when he invented the world's first practical hovercraft. It is a system which by the end of the century may have replaced the wheel – and the ship – for a large part of surface transport.

Cockerell's original 'hovercraft' of 1955 was an engagingly primitive device, consisting of a food tin fitted inside a larger food tin, powered by a handblower. Crude as it was this home-made device confirmed what Cockerell had already worked out theoretically – the startling lifting power of a 'ring' jet resting on a cushion of air. The next step was to see if a vehicle could travel fast and efficiently on a cushion of air. Hence the phrase Air Cushion Vehicle or ACV. The name 'hovercraft' was thought up by Cockerell and his wife.

It is a remarkable principle. Most other forms of transport have been suggested by nature: man saw a duck and thought of a boat; he saw a bird and dreamed of flying. 'But there ain't no hovercraft in nature,' as Cockerell so rightly pointed out. Cockerell was not the only man to think of the hovercraft principle, but he was the first man to develop it into something practical (rival claims by the American Melville Beardsley have not been upheld by United States courts). From these humble early experiments very much has already followed.

Today hovercraft not only transport cars and people across the Channel at three or four times the speed of a conventional boat ferry. They have explored impenetrable

parts of the world, as in the 1968 trip by an SRN 6 up the Amazon and down the Orinoco, sometimes called 'the last great journey on earth'. It would have been impossible by any other means. Hovercraft have gone to war in Malaysia and Vietnam, carrying troops across marshy land that would stop even a swamp-buggy. Hovercraft travel over snow and ice floes in the Arctic in conditions that would defy a boat or powered sledge. They can be used for shifting oil-rigs in Alaska when the ground thaws out in summer, making wheeled traffic impossible. They travel across sand like a tracked desert vehicle. The scope for hovercraft in under-developed countries where roads are primitive or non-existent is immense. The fully amphibious hovercraft can travel from land to water to mud to sand to ice to swamp to scrubland.

Hovercraft can be used to lift up aircraft that have got bogged down at the end of a runway. Hoverpallets like giant trays can be used for lifting heavy goods and machinery in factories or warehouses. It takes amazingly little power to lift a hovercraft on a cushion of air, and a hoverpallet using compressed air from a small paint sprayer can lift four tons of machinery in the air, and then be pushed around the floor by a man using one hand. A tracked hovercraft, the hover-train, is now being developed in Britain, America and France. When its speed of 250 mph is economically realized even the fastest forms of wheeled transport will be eclipsed. (Exciting developments with hovertrains and the British system, which looks like being 30 per cent cheaper than its foreign rivals, are dealt with later in this chapter.)

The use of the air-cushion principle does not stop at transport. 'Like any new technology of significance the whole system is proliferating in unsuspected directions,' Cockerell says. The hoverbed can be a life-saver for critically burned patients. A patient extensively burned can be suspended on a cushion of air, free from pressure and with greatly reduced risk of infection. There is a hover lawn-mower. There is now a hover kiln in the Potteries, which produces a teacup in fifteen minutes instead of the traditional bake in a kiln for

three days (a production cycle which has adapted itself poorly to the five-day week). The cups are whizzed along on a conveyor-belt which, at crucially high temperatures that no ordinary belt could stand, becomes an air-cushion conveyor-belt. Extreme heat can be followed by rapid cooling and, as the entire cycle takes only fifteen minutes, time is saved which can cut the price of teacups without detracting from quality. 'And yet,' says Sir Christopher, who was somewhat belatedly knighted by his Government in 1968, 'we are only at the beginning. The hovercraft is at the stage of development that the solid-tyred motor bus was in 1914.'

Cockerell, a soft-spoken man with a military-looking moustache and wispy side-whiskers, is like most great inventors: independent-minded and stubborn. For years he has conducted a running war with the National Research Development Corporation, who helped to finance the hovercraft and have invested over £3 million in it. After a lengthy debate he finally accepted the Corporation's offer of £150,000 (less substantial tax) for his invention, but he would have preferred to retain a continuing financial stake in the hovercraft, on the grounds that an inventor should draw reasonable royalties from his invention. 'Inventing isn't a way of making money,' he grumbles. 'If you want to do that it's better to be a Beatle or an ice-cream salesman.' But it hasn't stopped him wanting to go on inventing. He lives quite modestly with his wife in a detached house in a crescent on a hill in suburban Southampton, where the most spectacular ornament is the rose garden. There is a Mini in the garage and an ageing Jensen outside. He is by nature rather spartan and money is not very important. 'If I argue about money it's not for myself but because I think we should raise the status of all inventors.'

Cockerell is the son of the late Sir Sydney Cockerell, one-time curator of the Fitzwilliam Museum in Cambridge. Sir Sydney had worked his way to that august post from a coal-merchant's office. Though the son has much of the father's determination, he reacted strongly against the literary atmosphere of life with father. Even when people like Con-

rad, Hardy and Shaw visited the house in Cambridge, Cockerell preferred to be in another room tinkering with something mechanical. He once souped up his mother's sewing machine by fitting a small steam-engine to it. He spent much of his time taking motor-cycles to pieces—'the best guide to basic engineering I know'. Almost the only visiting celebrity to the Cockerell household who struck a chord in him was Lawrence of Arabia—not because of the man but because of his magnificent Brough motor-cycle, on which he eventually killed himself. 'My father considered me a garage hand. I regarded him and people who pursued the Arts as parasites who lived off the hard and necessary work of scientists and engineers.' (Age has brought maturity to Cockerell in this respect. He now collects antiquities proudly displayed in a showcase in his drawing-room.)

In addition to motor-bikes wireless had always been a passion, and after reading engineering at Cambridge he joined Marconi as an electronics engineer. He notched up a couple of dozen patents and had a brilliant war as a 'boffin'. He headed the team that produced the two-needle aerial—a direction-finder installed in every RAF bomber and popularly known as the Drunken Men because the needles swayed and crossed like two drunks supporting each other down the street. Cockerell also master-minded a device called Bagful, which located enemy radar and played no small part in the success of D-Day. 'The pressure of innovation during the war was intense. We were always thinking ahead to something newer and better. In a way it was good training but it was also very tiring.' When the war was over he wanted to get out and go it alone, but was several times persuaded to carry on. However, in 1950 at the age of forty he finally did so. He bought up a very small firm of boat-builders in the Norfolk Broads. 'I chose boat-building because it was one of the few remaining craft industries as opposed to the rush of factory life which I'd grown to hate.' Also it required very little initial capital.

Even so he was desperately pressed for money, and for a while he, his wife and two daughters had to live in a caravan.

But Cockerell found the boat-building business a mental restorative—like taking a Sabbatical. 'It was rather refreshing to be doing something the non-technical world could understand instead of producing mysterious electronic black boxes.' Within a year the old creative urge of all good engineers began to reassert itself. 'I found myself asking—why is a boat built the way it is? Can't it be shaped any better? Can't it be made to go any faster for the same output of power? As a man with a lifetime in electronics I was able to approach the conventional wisdom of boat-builders with a totally uninhibited mind. It's a fact that some of the great advances in science are made when people apply the techniques of another discipline. For instance, the biggest advances in archaeology in recent times have been brought about by biologists and geologists. I sometimes think that if some competent electronic engineers got into the Treasury and challenged their conventional wisdom, we'd probably have an end to stop-go in the economy.'

The notion that man could ride by skimming the surface on a cushion of air came to Cockerell, as most inventions do, not in one Eureka flash but by a series of logical steps, with here and there one of those imaginative leaps which distinguish the inventor of genius from just another good engineer. As a designer of boats Cockerell soon discovered that there are two sorts of resistance which the hull of a boat meets—wave resistance and skin resistance. These are complementary evils—less of one means more of the other and vice versa 'To reduce wave resistance you must increase the area of the boat and therefore its skin resistance. But if you reduce skin resistance by lowering the area of the boat, you increase wave resistance.' Surely there was a way round this dilemma. Cockerell's first thought was to lubricate the skin by establishing a thin layer of air between hull and water. The problem was how to contain and maintain the layer of air. His first idea was to have twin hulls with an air-bubble between, which would be kept in place and contained by curtains of water -by pumping water down and around, fore and aft.

There Cockerell stuck for a bit because he didn't know enough to be able to work out the probable duct and other losses and the sort of power that would be required. 'Then one Saturday evening I thought I would have a go at using air-cushions instead of water-curtains. A simple calculation looked all right on a power basis and so that Sunday I made up an annular jet using two tins.' This famous home-made apparatus worked and with the predicted gain in lift. The larger tin was open at both ends, the smaller tin which fitted inside was open at the bottom. The nozzle of a hair-drier was placed over the top of the larger tin. As air was squirted down the narrow gap, or ring, between the two tins a bubble of high-pressure air was trapped in the middle. The results as measured by a pair of kitchen scales placed underneath the down-draught—were exciting. Though the measured 'thrust' of the hairdrier was normally only 1 lb., when it was pushed through a 'ring'-jet like this, thrust rose to 3 lb. In other words a hovercraft near the ground can be supported by a basic thrust much less than the weight of the craft. Another useful point emerged: the bigger the craft the less proportionately was the leakage of air round the outer circumference. Cockerell found that if he doubled the diameter and doubled the thrust he could quadruple the total area and weight. With a hovercraft weighing several hundred tons a jet in calm sea can lift a weight as much as a hundred times greater than its thrust.

So, up to the point where construction difficulties set in, the bigger the hovercraft the more efficient it becomes. But for Cockerell in 1955 came the hardest part of any inventor's life—convincing those with money and resources that the invention was valid. For more than a year he peddled his idea. The aircraft firms were interested but the hovercraft was not a plane. The shipbuilders were interested -but the hovercraft was not a ship. (It still suffers today from being a hybrid and having to make do with components from each industry. Aircraft parts are too dear, ship components are too heavy.) In the end Cockerell realized that there was only one thing to do—build a working model on lines more con-

vincing than the food tin and the blower. He was so short of cash that the idea would have foundered had not a friendly neighbouring boat-builder, A. D. Truman, built a 2-foot 6-inch machine for him. Like any good patriot Cockerell then offered his invention to the Government In November 1956 Lord Mountbatten asked the Admiralty to look into Cockerell's idea. The Admiralty, on the grounds that it was not a proper boat, shuffled the device on to the Ministry of Supply. A demonstration was held in a basement in Whitehall where the little hovercraft, belching diesel fumes, buzzed around the floor at such speed that one anxious civil servant jumped onto a chair.

The official mind reacted predictably by placing the hovercraft on the secret list, and then in Cockerell's estimation at least doing its best to pigeon-hole the entire idea. Fortunately the then deputy director of aircraft research at the Ministry, Ronald Shaw, had more adventurous ideas. His was a receptive mind thanks partly to having helped Barnes Wallis develop some of his more revolutionary ideas like the famous Bouncing Bomb. Virtually off his own bat Shaw got a £7,500 Government contract placed with Saunders Roe, the Isle of Wight flying-boat builders, to construct a full-scale hovercraft. Even so, the hovercraft was in danger of dying under the Official Secrets Act until in September 1958 the Ministry agreed to declassify the project. But this time Cockerell had already got a £1,000 advance under a gentleman's agreement from the NRDC to prove his ideas, and now the way was open for commercial exploitation.

The NRDC gave Saunders Roe a contract to build a prototype the SRN 1 (for Saunders Roe Nautical). It was 30 feet long and 24 feet wide, and could reach twenty-five knots It took them just eight months to design and build at a cost of £120,000. Its first public trials took place in June 1959 and it triumphantly crossed the Channel the following month the fiftieth anniversary of Blériot's pioneering flight across the same stretch of water on 25th July 1909. The SRN 1, a 'vintage' hovercraft which now has a place of

honour in the Montagu Motor Museum at Beaulieu in Hampshire, was very much an experimental craft and more work was needed to improve seaworthiness and efficiency. This led to the development of an idea which Cockerell had originally put forward in 1957 of flexible skirts around the circumference of the hovercraft. The skirts filled the gap between the hull and the surface. They not only helped retain the air cushion, but more of it too, so that the hovercraft could skim over obstacles.

In July 1959 Saunders Roe was taken over by Westland, the helicopter firm, and they continued the development of bigger, more sophisticated, craft. The SRN 2, besides being three times as fast as its predecessor, had four-foot flexible skirts which enabled it to surmount three-foot boulders. It was the first passenger hoverferry in the world. A larger, faster SRN 3 was built for the Ministry of Defence. Next in number, but last to be built, is the biggest of the breed so far, the SRN 4 or Mountbatten class, which costs £1,750,000.

The monster Mountbatten measures 130 feet long by 76 feet across the beam, and its two great rear fins are as high as a four-storey block of flats The SRN 5, or Warden Class, is a smallish, eighteen-seat, high-performance hovercraft widely used for police, naval and customs duties all over the world. A stretched version, the SRN 6, or Winchester class, with only marginally reduced performance but more than twice the payload (thirty-eight passengers) has now become the world's most widely used hovercraft ferry. As the SK 5 and SK 6 these hovercraft are made under licence in America by Bell Aerosystems, with American engines.

The 'jumbo' among hovercraft, the SRN 4 Mountbatten class, is basically a development of two SRN 3s placed side by side, and was first ordered by two Swedish shipping lines – Swedish American and Swedish Lloyd. The Mountbatten is principally used as a car ferry on short, open sea routes such as Ramsgate to Calais. It was first launched on a cold February afternoon in 1968 on an East Cowes, Isle of Wight, slipway. 'The monster craft lifted itself up on its great 7-foot

deep skirt and skimmed off up the Solent. It was so huge it looked like the end of a pier floating away.'[1]

In calm waters it can achieve the extraordinary speed of seventy knots: in rough seas with ten- to twelve-foot waves it can still go at twenty-five knots. Though the SRN 4 had substantial teething troubles these have now been successfully overcome. It was a case of trying to do too much with too little cash—and of delivering to the customer an experimental type rather than a fully developed craft. 'There should have been an experimental forty-tonner to begin with, but the firm did not have the funds,' says Cockerell.

Now even the SRN 4 seems too small for cross-Channel work. As techniques and materials improve so does the optimum size. 'A 300-tonner would now be right for Channel crossings and would allow travel on very bad seas,' says Cockerell. He thinks the development after that will be a 5,000-ton transatlantic hovercraft freighter, possibly atomic-powered, which could cross the Atlantic in twenty-four hours, would rival conventional shipping for more expensive types of cargo and would undercut passenger plane travel.

The development of the hovercraft has not been a tranquil one. Cockerell, naturally impatient with the slow development of his ideas, has blown his top more than once. Money has been short; it always is, especially for revolutionary inventions, but Cockerell thinks the Government should have done more. 'We have fiddled about with Government and NRDC expenditure of £3 million which is about the cost of developing the VC 10's tailplane and less than 1 per cent of Britain's share of the Concorde's development costs. America can afford to spend ten times as much as ourselves on research and development, so we have to be selective. Adequate Government financing of a major hovercraft programme, which would enable the industry to set up its own supply of specialized parts and components, might cost £50 million spread over eight years—a sum well within our capability.' This is not subsidizing romantic technology. It is the sort of sum that could put Britain con-

1. John Vass, *Hovercraft*. Macdonald, 1969; page 11.

vincingly ahead in the hovercraft race, with a leading chunk of a £300 million a year world hovercraft market in the eighties. But at present, thinks Cockerell, we are in danger of losing out to America—and the Japanese. 'It is typical of this country. We start things in a damned good way—radar, radio, computers, penicillin but we don't follow them up energetically. By an extraordinary act of folly we licensed our most terrifying competitors the Japanese to make hovercraft. It's all right to licence where you are dealing in refinements to a well-established technology. But not with an entirely new and revolutionary industry where you want to keep your lead.'

In 1966 Cockerell quit as technical director of Hovercraft Development Ltd when the Government decided to take over research and development at the National Physical Laboratory, thus turning the hovercraft pioneers into civil servants. Likewise he protested when the then Minister of Technology, Frank Cousins, merged the two biggest hovercraft companies, Westland and Vickers, into the British Hovercraft Corporation, in which the NRDC has 10 per cent of the capital.[2] Several independent design teams and managements are required, he believes, to develop the sixty or so different types of craft likely to come into being when the industry reaches full development. In fact the BHC monopoly in the United Kingdom was dented in 1967 when the NRDC licensed Hovermarine and Vosper-Thorneycroft the fast patrol-boat specialists to produce rigid sidewall craft for purely seagoing use. Because they have not got flexible skirts these craft cannot travel overland, although the 70-ton Vosper-Thorneycroft can be nosed up a ramp for loading and unloading. Another firm, Enfield Marine (makers of the famous Lee-Enfield rifle), is also building 40- and 70-ton fully amphibious craft. Hovermarine has now fallen under the American hammer—at what Cockerell regards as a knock-down price. In 1970 Cockerell's £4,000 a year consultancy job with NRDC was also terminated; so to date his rewards from his invention have been minimal.

2. In October 1970 Westland bought out Vickers's stake.

But all is not gloom—very far from it. Around 100 of the SRN 6, the world's most popular hoverferry, have been sold to countries all over the globe, in addition to the ones built purely by private capital—a sign that Sir Christopher was quite right when he said that the hovercraft should be allowed the free-for-all development that profited other industries in their early days, like motoring.

The 'Baby Austin' era of the hovercraft is now approaching. Amateur-built craft and the growth of do-it-yourself kits -the Express Air Rider designed for school-building is now the biggest fleet of light hovercraft in the world—show just how popular the hovercraft has become at grass-roots level, especially among the young. What the Ministry of Technology liked to call 'the fifth mode of transport' has already come a long way since Sir Christopher's experiments with tin cans. This great British invention has even further to go.

Chapter 29

MOTORS, MOTORMEN, ENGINES AND MINIS

With exports running at a record £1,565 million in 1973, which exceeded imports by £803 million, the motor industry is still far and away Britain's biggest single exporter. It accounts for over 17 per cent of total exports of manufacturers, and two-thirds go to the most highly competitive markets in the world Europe and North America. The decade and a half till the 1970s saw the British motor industry slip from number 2 place in the world production league to number 5. Much of the decline was due to restrictionist government policies. Whereas West Germany, for instance, had a purchase tax rate of only 11 per cent the British industry laboured under purchase tax of 37 per cent as well as hire purchase restrictions and government-induced recessions designed to correct balance of payments problems. The industry also suffered from self-inflicted wounds caused by unofficial stoppages, whether on the motor assembly lines or among components suppliers. It was in volume production that the industry fared poorly compared with continental competitors; in engineering inventiveness and excellence of design the British motor industry has few peers.

It is particularly strong in the specialist and 'up market' class cars which are the most profitable to produce and export, like the Jaguar, Triumph and Rover 2000. The British Leyland Motor Corporation has been able to sell every Jaguar, M.G. and Triumph car, whether sports model or Stag 3-litre saloon, that it can land in America. The Marina has shown itself a car of wide European and American appeal. Jaguar's XJ6, with its 4 2 litre engine and a silent 120 mph combined with great riding comfort and road holding, for years commanded over £1,000 above list price on the black market. Jaguar's problem has always been to

produce enough cars to meet demand with annual output running at around 40,000 units. In 1971 Jaguar introduced the exciting V12E, powered by a new 12-cylinder engine. This is one of the most complex engines ever built for volume production—but the automated plant with an eventual capacity of 1,000 power units a week requires only one-third of the labour per engine needed for a six-cylinder engine.

William Lyons (now Sir William) built up the Jaguar group from a motor-cycle side-car business that he started in a back street of his native Blackpool in 1922. He also made specialist bodies for (among others) Herbert Austin's legendary Austin Seven, and the quality and finish were always better than those of the ordinary mass-production car. Yet the price still remained within reasonable limits: not more than 50 per cent above the price of a comparable mass-produced car. The firm came to Coventry in 1928 and there from 1931 he began to make SS bodies (SS stands for Swallow Sidecar) on the Standard chassis. It was a long low fast car like all the Jaguars since. In 1935 SS Cars Ltd became a public company, with Sir William firmly in control. Until his retirement in 1972 he remained the chief of the Coventry works—the last great pioneer of the motor industry to exercise personal control despite his firm's merger with the British Motor Corporation (as it then was) in 1966. Six years prior to that Jaguar had acquired the old firm of Daimler which gave them a foothold in the big limousine market But Jaguar's tradition of individual design and high performance at relatively low cost was unaffected, though now the firm is part of the still larger combine formed when Leyland, the biggest commercial-vehicle builder in Europe, merged with BMC in 1968.

The British Leyland story is a remarkable one if only because by a process of growth, take-over and merger it has transformed Leyland, a north-country manufacturer of lorries, into the third biggest motor manufacturer in Europe.

In 1969 for the first time more cars (9·4 million) were produced in Western Europe than in America. In Britain BLMC was not only the biggest but the only British-owned

car company in the country's Big Four and with the most complete range of cars in Europe. It employs some 180,000 workers in fifty-nine factories with an output in 1973 of over a million units. To the year ended 30th September 1973, BLMC had sales of £1,564 million which included £424 million exported from the United Kingdom, the highest export figure ever achieved by any British company. Total overseas sales (if you also include BLMC cars made wholly or in part abroad) were £744 million which was 48 per cent of the firm's sales.

Chairman Donald Gresham Stokes, born in 1914, started as a student engineering apprentice with Leyland in 1930. Apart from the war years, when in the army he reached the rank of lieutenant-colonel, he has spent his entire time with the firm, and was probably at his most successful as a sales director.

As chairman of BLMC he has shown himself professional and tough, and he has needed to be in a company long overdue for rationalization, particularly in its troubled Austin-Morris division. If Lord Stokes has a fault it is that of over-optimism, but he has shown remarkable faith and resilience through difficult times. 'The trouble with us British is that we don't appreciate what we have. This is a great country and it is going to be even greater.' BLMC can point to some shining successes in addition to the Jaguar and sports car range.

The firm's magnificent Land Rover is one of the major success stories of the British motor industry. In the quarter century since it was launched in 1948 three-quarters of a million had been sold, of which well over half a million had been for export. With their four-wheel drive and go-anywhere capability Land Rovers can never become obsolete. They are being turned out at the rate of 60,000 a year and production facilities are still being expanded. In its new and more powerful eight-cylinder version the Land Rover has successfully fought back against competition from its major Japanese competitor Toyota. One day in 1970 a letter arrived at Rover's Solihull works from a Polish schoolboy

addressed simply to 'The world's most versatile vehicle'. The Post Office had added: 'Try Land Rover, Solihull'—and they were right.

Besides making a wide range of lorries Leyland is also the world's second biggest bus manufacturer (after Mercedes); 1971 saw the launching of the Leyland National Bus, a revolutionary single-decker, one-man-operated vehicle built to a new method of light construction in which the sheet metal body takes many of the stresses rather than having a heavy chassis. This made for a lighter, more rigid, design and one that was less costly to produce. Passenger comfort is a prime consideration, with demisting of side windows, curtains of hot air across the doors, a comfortable internal temperature even in freezing conditions and better accident protection than any previous bus. 'Quite the smoothest, quietest bus ride I've ever had,' commented London Transport's chairman Sir Richard Way. 'It corners beautifully.' Leyland also concentrated upon corrosion resistance, a major hazard now that roads are heavily salted in wintry conditions, and have designed their bus to last in all conditions for twelve years. The Leyland National Bus Plant at Workington uses car production techniques for the first time to produce buses—a point noted with admiration and envy by its competitors. In a decade in which, on environmental grounds, bus travel was taking growing precedence over cars in crowded cities, Leyland's buses (the Corporation also makes the Daimler and AEC) were poised for a major share of a market running at over £100 million annually.

Leyland has also started limited production of gas-turbine heavy lorries, which will prove especially suitable for steady high-speed cruising at 70 mph on motorways. When Leyland took over Rover they inherited twenty-five years of experience in gas-turbine technology. There is no hot blast from the exhaust of the gas-turbine truck. The heat is re-harnessed to pre-heat compressed air prior to combustion. Fuel consumption is low at high cruising speeds, there is remarkable freedom from vibration, gear change is automatic, and be-

cause of more efficient combustion there is much less pollution.

Among commercial engines the remarkable Peterborough-based firm of Perkins topped £100 million for world sales of its diesel engines in 1969. Altogether there are 2,500,000 Perkins engines in service in the world operating in almost 170 countries in cars, trucks, tractors, combine-harvesters, boats and industrial equipment. Perkins has astonishing dominance in certain fields such as agriculture, where 70 per cent of the combine-harvesters and 30 per cent of the tractors operating in the world today are powered by Perkins engines. Yet when the firm was started in 1932 by the late Frank Perkins, who came from a family of skilled engineers, it had just four employees and one tiny workshop in a factory in a Peterborough back street. They made an engine a week compared with today's 7,500. From 700 workers in 1945 they now employ 9,000 today. The firm makes almost 400,000 engines a year, providing some 20 million horse-power for world-wide customers. About 86 per cent of Perkins's production in the United Kingdom is exported, either directly or in the products of other manufacturers. The firm's first major success was the six-cylinder P6 engine first made in 1937, which was smoother and quieter than any competitor's for many years. When it was superseded only a few years ago over a quarter of a million had been sold.

In 1957 the company went public: in 1959 it became part of the international Massey-Ferguson group, and this opened up a vast market in engines for tractors and harvesters. Perkins has been particularly successful in the development of high-speed, lightweight engines, in part due to the success of a new combustion chamber suitable for small cylinders, and a revolutionary distributor type fuel pump. The firm spends more on research and development than any other comparable firm, partly to improve the company's present engine range, extending from 18 bhp to 170 bhp, partly to develop new engines and applications. Testing in all kinds of conditions and all parts of the world from sunshine to snow

is rigorous. The field test department averages a million miles a year.

Perkins has been a pioneer in high-speed diesel development with its work on turbo-charging and fuel injection. Its largest engine, the V-8, is especially designed for high-speed lorries on the world's motorways. In all over 900 major manufacturers all over the world use Perkins engines, and these include famous truck- and motor-makers such as Bedford, Berliet, Ford, Hotchkiss, Scammell, White and Willys. Perkins's salesmanship and service are intensive.

Besides the British factory, Perkins engines are manufactured locally or assembled in Argentina, Australia, Brazil, France, India, Italy, Japan, Mexico, Spain and Turkey. For many countries anxious to start their own vehicle industry the establishment of a Perkins plant producing an internationally accepted range of engines has been a vital first step. Teams of technicians and inspectors from the parent company live on the spot to ensure that Perkins standards are maintained. This is backed up by a world-wide after-sales service, of parts and trained personnel.

The firm has an unusually close relationship with customers. People from all over the world attend the Perkins product training school at Peterborough, including, in addition to distributors and engineers, single customers: one of them was the late Sir Francis Chichester, the round-the-world yachtsman, who used a Perkins engine for auxiliary power in *Gipsy Moth IV*.

The 1970s look like being the decade of the diesel, first because of its greater fuel economy at a time of energy shortage and increasing fuel costs all over the world, secondly for environmental reasons. Research has shown that diesel engines cause much less pollution than petrol engines Perkins diesel engines have been awarded the United States Department of Health's Certificate of Conformity.

Britain's unrivalled experience in the 1½-litre range of petrol engines prompted Ford of America to choose the Dagenham-built 1500-c c. engine for its sub-compact car, the Pinto. The British designed and made Ford Formula One

3-litre engine has proved an outstanding racing success, with four consecutive World Championship victories since 1968.

Britain may fairly claim to have pioneered the modestly priced sports car derived from the small, mass-produced family car. The MG (it stood for Morris Garages) has been pre-eminent in this field. The MG, exported in considerable numbers to America after the Second World War, besides giving rise to innumerable jokes (truck driver looks down on a college youth in MG: 'And what else did Santa Claus bring you for Christmas?') gave the United States a taste for sports cars which led to the manufacture of native products like Chevrolet's Corvette At the top of the volume-produced sports car range was Jaguar's famous XK series, later to be replaced in 1961 by the equally famous E Type. It was during the fifties that Jaguar enjoyed great racing triumphs, including victories at Le Mans in three successive years 1955, 1956 and 1957. Between the Jaguar and MG ranges come the highly successful Triumph TR cars. The TR2 of 1953 was a 108-mph car of remarkable economy: it gave 40 mpg at a constant 60 mph. The TR3 sold 75,000 models before being replaced by the TR4 in 1962. The TR6 could well be the top-seller of them all.

BLMC command the biggest simple share of the domestic market (32 per cent in 1973). Ford are an easy second at 22·5 per cent and the two other American-controlled firms Chrysler (formerly Rootes) and Vauxhall (owned by General Motors) are neck and neck with just under 10 per cent each. At one point in 1973 foreign imports rose to a third of the British market—largely because of the self-inflicted wounds of the British industry in which strikes either in the car firms themselves or among suppliers cost a staggering 460,000 vehicles for the year. The overall import figure for 1973 was 27 per cent of the British market but by 1974 the foreign car boom was waning, principally because of the much higher cost of insuring and servicing foreign cars and their poorer trade-in value. The famous specialist cars are concentrating in the remaining 2 per cent, but their influence on design and their reputation make them more important

than their production figures would at first indicate. Rolls-Royce and Bentley are in the enviable position of selling all the cars they can build. The David Brown Corporation (named after founder Sir David Brown) is the third biggest tractor group in the world, but is equally famous for its Aston Martin cars, and in the Aston Martin DBS V-8 it has made a magnificent and elegant-looking machine with the sort of acceleration that pins you to the back of your seat. Top speed in fifth gear is 170 mph, but even in second it reaches the top United Kingdom speed limit of 70 mph. Jensen and its Interceptor are enjoying a new lease of life under a group of Americans, with veteran Donald Healey, doyen of British sports car designers, coming in as head and his son Geoffrey on the board. Healey, who designed sports and rally cars for Triumph pre-war and had a great success after the war with the 3-litre Austin Healey and the frog-eyed Sprite, has now produced his 2-litre Jensen-Healey Sports car aimed especially at the Californian market.

All the specialist sports car firms like Morgan, TVR and Lotus have had prosperous times in the sixties, none more so than the Tamworth-based company of Reliant, some six times larger at the end of the decade than in 1960, and the biggest single producer of glass-fibre body shells in Europe. It makes economical three-wheelers as well as sports cars. The Reliant Scimitar is a good-quality, high-performance car with a touch of individuality.

The dominant influence in racing design in the sixties was undoubtedly Colin Chapman, restless and irreverent chief of the Lotus Group, and very likely the greatest living designer of racing cars. His genius in the design of suspensions has had a world influence. Soon after the war Chapman cut his teeth on car design by rebuilding an Austin Seven in the back shed of his girl friend Hazel Williams's house at Muswell Hill in London.

When he had finished rebuilding the Austin, Chapman had it registered as a Lotus – the first ever built. 'The name has no particular significance. I just liked the sound of it,' he

Lord Beveridge (above) - Genius, philosopher and architect of the welfare state, pictured in 1942, year of publication of his famous report.

ohn Maynard Keynes right) – who revolutionised economic thinking and demonstrated how depressions could be avoided by government action.

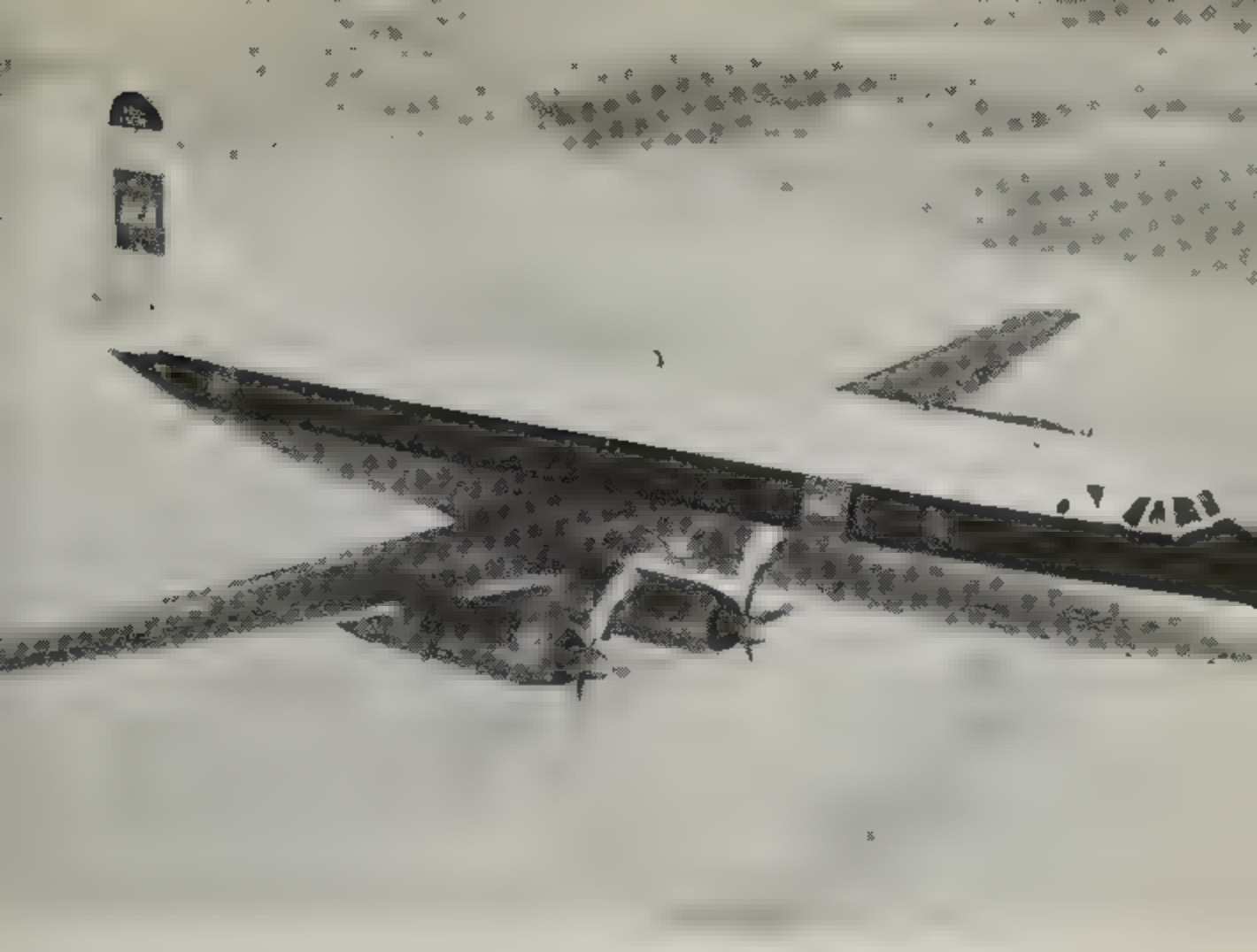
Sir Robert Watson-Watt (above) inventor of Radar.

Sir Christopher Cockerell (below left) inventor of the Hovercraft

Sir Alexander Fleming (right) – in his laboratory at St. Mary's Hospital, Paddington, where he discovered Penicillin.

Sir Barnes Wallis · inventor of the bouncing bomb and pioneer of the swing wing aircraft, pictured here with one of the last of the Lancasters.

The Hawker Harrier - the world's first operational VTOL fighter landing in a disused London coal-yard.



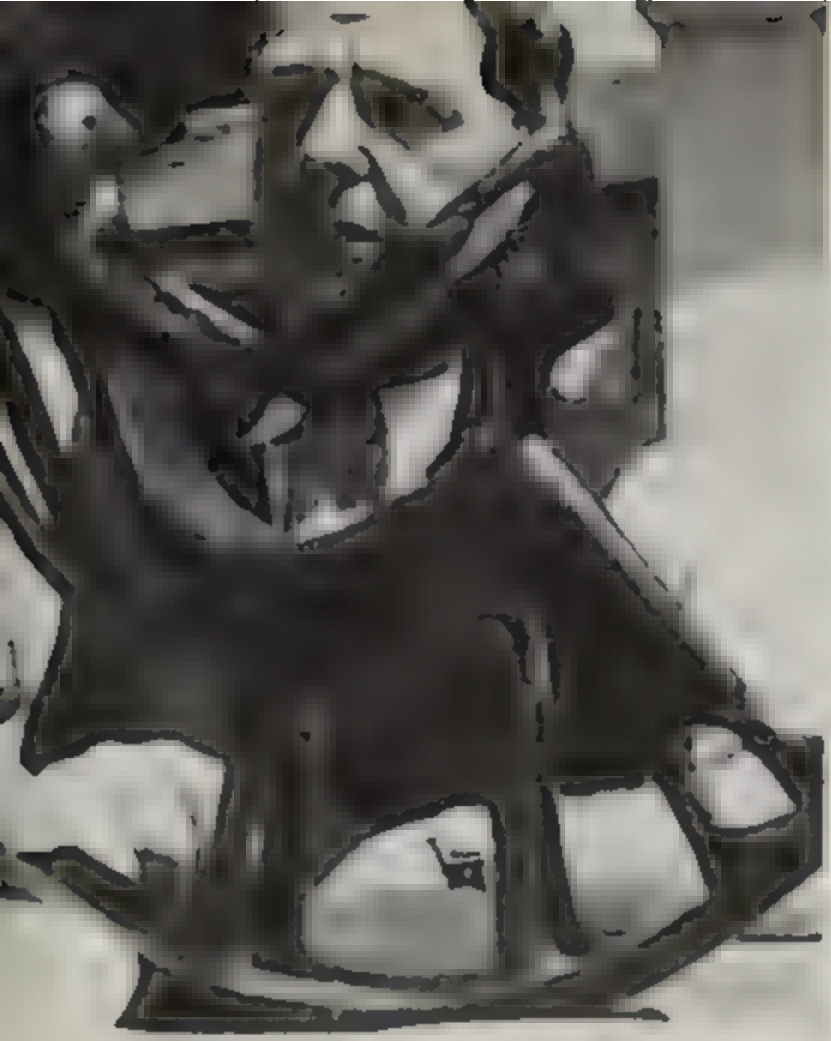
The Vickers Viscount (above) another first, this turbo-prop airliner was the workhorse of world aviation in the 50's and early 60's – 444 were built.

Sir Alec Issigonis and his mighty Mini (below) – ten years ahead of its time in convenience and economy, Mini and designer are seen here with a display commemorating its success as one of the country's biggest foreign currency earners.

Left: Graham Greene - Our foremost Catholic novelist with Pope Paul after a private audience in 1965.

George Orwell (below right) – a novelist who influenced the thinking of the world with 'Animal Farm' and '1984'.

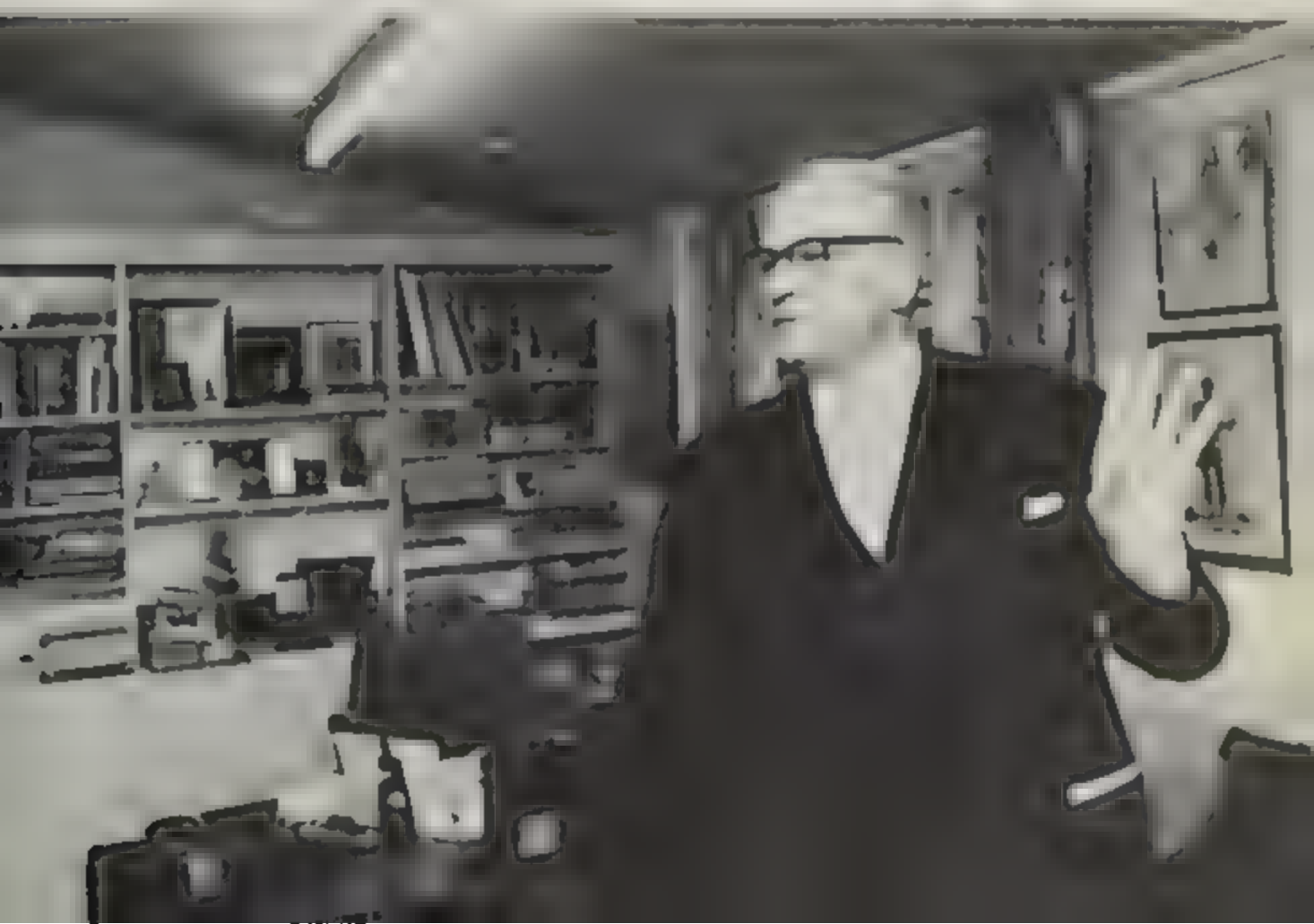
Agatha Christie, the Queen of Crime (below left) celebrates a birthday of the 'Mousetrap', the world's longest running play.



Henry Moore and 'Woman and Child in Rocking Chair' (above left) – born a Yorkshire miner's son, he is one of Britain's leading artists.

Alfred Hitchcock (above right) Master of the macabre, the sinister and the chilling.

Lord Olivier (below) pictured here in the Waterloo office of the National Theatre, which he helped found and later directed.



Benjamin Britten (above) in double creative role, conducting one of his own compositions.

Margot Fonteyn (below) whose prestige has reflected on all British ballet, seen here in a moment of relaxation.

says. The early Lotus ran only a few trials in 1948 because Chapman was sitting for his final examinations in engineering at London University. He duly passed, joined the RAF for National Service, gained his wings and rebuilt another Austin Seven, this time powered by a Ford engine. After the RAF Chapman took a job as an engineer with British Aluminium, which doubtless gave him an added interest in making his cars light. In his spare time he still laboured with bits and pieces of metal and various other manufacturers' components to produce a better car.

In 1952 Lotus Engineering was formed: the 'factory' was an old stable at the back of a pub, the Railway Hotel, which his father owned in Hornsey. The Lotus Mark 6 was his breakthrough design the chassis weighing only 90 lb. Alas, on the eve of its first international meeting in 1952, the Mark 6 was destroyed on the public highway by a van which shot out of a side turning. Perilously short of cash, and with a wrecked car as almost his only asset, Chapman borrowed £25 from Hazel, who was soon to become his wife. 'I roped her in to help me right from the beginning,' recalls Chapman. 'She did most things around the place, coped with all the paperwork, acted as errand-boy and made the tea. She wasn't exactly a car enthusiast, but she just couldn't avoid it. It was the time of my life when I needed some voluntary unpaid labour. Mind you, I can still use a bit of it today.' In time Hazel's £25 was to grow into many millions on the London Stock Exchange, but for the moment Lotus faced a crisis. It was cured by sheer hard work plus Chapman's inventive skill. The Lotus 6 had a Chapman-designed space-frame instead of the usual Austin chassis, and it was in great demand on the race-tracks. He still had his full-time job, so his tiny work force got on with producing the Mark 6 by day, and by night Chapman, returning from his nine-thirty to five-thirty job, constituted the night shift.

By 1955, such was the demand for the Lotus, many of which were sold in kit form, that Chapman, now twenty-seven, was able to give up his other job and make Lotus his full-time occupation. In 1956 the first Lotus Formula 2

appeared and earned itself plenty of publicity at the Motor Show; 1957 saw the first glass-fibre Lotus Elite, with a top speed of 115 mph; enthusiasts clamoured for it; it was time for Chapman to quit the Hornsey stable, where local residents were in any case complaining about the noise, and move to works with reasonable production facilities at Cheshunt, Hertfordshire. In 1960 came the first Lotus Grand Prix victory when Stirling Moss won at Monaco. By this time Chapman had placed the engine behind the driver, thus following the design layout pioneered by another famous British racing name, and one-time Lotus rival, John Cooper and his team at Surbiton. The rear engine cuts out the need for a power-wasting series of transmission shafts, enables the driver to sit lower in the car, which reduces frontal area and wind resistance, and gives excellent traction on the back wheels.

The Cooper, rear or mid engine, was copied by Ferrari and Maserati, and it revolutionized the design of racing cars. The Coopers, father and son, achieved big successes with their tiny Cooper powered by the Coventry Climax, an engine originally made for fire brigade trailer pumps during the Second World War. The Cooper-Climax powered Jack Brabham to two world championships in 1959 and 1960 and gave Stirling Moss many notable victories too. But the 1½-litre Lotus 25 of 1962, with its monocoque construction, was a radically different type of racing car, and for the next three years, with Jim Clark at the wheel, it dominated Grand Prix racing. At the same time Chapman produced the £1,090 120-mph Lotus Elan, his first truly profitable production car. This provided underpinning for Chapman's racing activities He had already established a close liaison with Ford of Britain and the next move was a deal with Ford of America to produce a car that would win the world's richest motor race, the Indianapolis 500.

With characteristic confidence Chapman declared that if Ford could produce for him a 350-bhp engine running on normal fuel he could produce a car that would convincingly see off the far more powerful but cumbersome front-

engined American machines that had thus far dominated the race. In 1963 Clark lost narrowly in a controversial finish; 1964 saw both Lotuses eliminated by tyre trouble; but the following year Clark won handsomely with two minutes to spare, the first British driver ever to win the race. In January 1966 the Grand Prix became a 3-litre contest and Chapman now used a modified Ford engine instead of the Coventry Climax. Chapman's skill at building cars lighter and more advanced than anyone else resulted in his cars winning more than twice as many World Championship Grand Prix races as his nearest competitors Ferrari and BRM. In 1966 the firm had grown so big that it had to move to a large factory site at Hethel, near Norwich.

Until Clark's tragic death in a formula 2 Lotus at Hockenheim in April 1968 this was motor racing's Golden Age, the collaboration of the world's greatest designer with the world's greatest driver. Those close to Chapman say he would have liked to pull out of racing at once when his friend and colleague was killed, but contracts obliged him to continue. Chapman also ran the world's most successful racing team, and by 1970 had won the World Championship for Constructors four times.

For this energetic man still in his early forties there were fresh worlds to conquer in the seventies. But if one had to nominate the most influential car of the sixties it would be the Mini. Issigonis's mighty Mini introduced front-wheel drive to the mass-motoring British public, gave a word to the language and probably taught more young Britons how to drive than any other model. The Mini story now follows.

'I was really weaned on Austin Sevens, so it is, perhaps, natural that in my professional work I dislike designing big cars.' Sir Alec Issigonis.

There are a few really great cars in history ones which have helped to shape the lives of a generation. They include the Model T Ford, the Volkswagen—and the Mini. Of the three only the 'Mini' has given a word to the language which has been used to describe a host of other things.

Two million Minis were sold within ten years of its launching in 1959, the first British car to achieve this figure. In 1970 the millionth Mini was exported. Today the Mini's sale in all its various forms—saloons, estate cars, vans and Mini-mokes—remains a remarkably constant 250,000 a year. It is superbly economical and unlike almost any other baby car it is totally classless. You will see it on a council estate or outside Lord Snowdon's apartments in Kensington Palace. It is driven by the middle aged and elderly and also by the young, especially in the hotted-up Mini-Cooper versions. The Mini is the most successful car in British history, a fine tribute to its designer, Sir Alec Issigonis. How did it get its name?

Sir Alec himself is vague and thinks that perhaps it just evolved, partly at the behest of the late Sir Leonard Lord (later Baron Lambury). As head of the British Motor Corporation, Sir Leonard took the £10 million gamble to put the Mini into production. Sir Alec's old friend George Dowson, a racing enthusiast who was very much in at the birth of the Mini, recollects that his wife had a Morris Minor convertible which was always known affectionately as 'Minnie' (or it might have been Mini, nobody ever bothered to spell it out). But the man who really christened the Mini was Alex Moulton, brilliant inventor of the Mini's hydrolastic suspension and also the designer of the mini-bicycle which bears his name. Moulton remembered that Issigonis's prototypes known as 'orange boxes', so-called because of their bright colour, started buzzing round BMC's Longbridge works in Birmingham about the time the Russians put up their first Sputnik in 1957. So for a while they were referred to as sputniks. However, this was scarcely a good name for a British car; so, since Austin and Morris were the two car firms that merged in 1952 to become BMC, Alex Moulton suggested Austin Seven, thus recalling the highly successful baby Austin of pre-war days, which in 1922 was the world's first really practical small car.

How then should the Morris contribution be recognized? At that point George Dowson, according to Moulton, started an interesting train of thought. 'There was the Morris Major

before the war. There's your Morris Minor now, Alec,' he said. 'What about Morris Minimus?' This was logical but sounded pompous and inappropriate. Finally Alex Moulton came up with the crucial suggestion: 'Why not Morris Mini Minor?' BMC's publicity and advertising people, while applauding the rebirth of the Austin Seven, were appalled at the notion of the 'Mini'. Now, of course, they have had to admit how totally wrong they were. Very soon the Austin Sevens were being called 'Minis' too, and the old name died completely.

It was a revolutionary design for the late fifties. Issigonis wanted to get a roomy four-seat car which was less than 10 feet long. In conversation this shy but genial man always refers to it as the 'Three-Metre' car. To save length he hit upon the idea of the 'transverse engine', in which the engine is placed sideways between the front wheels instead of running lengthwise. Until then nobody had thought it possible for a 10-foot car to seat four in comfort unless the rear-seat passengers were amputee dwarfs. It is a fitting tribute to the Mini concept that two of Europe's major manufacturers, Renault and Fiat, have copied the basic Mini concept of transverse engine and front-wheel drive for their newly launched Three-Metre cars.

The Mini was not Issigonis's first success. His more conventional Morris Minor was in production for twenty-two years until 1970, and was the first British car to pass the million mark. The story of the Mini begins in 1956 when Sir Leonard Lord, whose BMC was then the biggest car firm in Europe, decided that with the post-war seller's market in cars coming to an end the time was right to introduce a car of advanced engineering and design. Issigonis had left Morris at the time of the merger with Austin to work for Alvis. Now he was invited to return to the BMC fold. An advanced design is certainly what he supplied. The Mini was the first British mass-production car with front drive and all-independent suspension; it was the first mass-production car in the world to use rubber rather than metal springs and to do it all on road wheels with a rim diameter of less than one foot.

Sir Alec (he was knighted in 1969) was born at Smyrna in Asia Minor in 1906 -Greek by name but British by birth and habit. His father, a Greek marine engineer, was a naturalized Briton, and when in 1922 Smyrna was attacked by the Turks the Christian population, including the Issigonis family, were forced to flee. They were evacuated by the Royal Navy, but *en route* for Britain Issigonis senior died in Malta. Alec was just sixteen when he arrived in Britain with his mother, and soon he would need to become a wage-earner. Curiously the inventor of the Mini actually failed to matriculate when he studied engineering at Battersea Polytechnic. He had no liking for maths or theoretical calculations. Once the basic laws were firmly in his head he preferred to make things to see if they would work. He calls himself 'a glorified blacksmith weaned on Meccano'.

He was chief designer with Morris at thirty and with George Dowson, working in a ramshackle workshop in Oxford, he developed his passion for small cars. Together they designed an Austin light-weight special, a highly successful racing car with rubber suspension (foreshadowing the Minis). To save weight they even refused to paint it. During these rather hectic times Issigonis learned two important lessons: firstly, the great convenience offered by the small car in day-to-day motoring; secondly, how easy it is to make a potentially unstable car directionally stable if it is nose-heavy.

When he came to design the Mini these two lessons were paramount in his mind. Whereas most new cars are the product of a design committee following intensive market research, the Mini was designed by Issigonis alone from the wheels up. It is for this reason that he calls himself 'the last of the Bugattis', for the great Italian car-master was also a one-man 'team'.

It was the Suez crisis of October–November 1956 which helped to dictate the final shape of the Mini. As a result of the blocking of the Canal fuel became strictly rationed, no one knew for how long, and Sir Alec, who needed no injunction to think small, now had an added incentive to produce

an economical 'baby'. To meet the fuel shortage people had been importing tiny three-wheeled bubble cars with noisy, single-cylinder engines and poor performance, though undeniably low fuel consumption. One such bubble-car owner was Alex Moulton, who drove his machine to BMC's Longbridge headquarters in Birmingham to see Issigonis. 'I took one look at the bubble car and shuddered,' recalls Sir Alec.

Moulton relates that Issigonis had one short ride. 'That determined him that any small car he made would have *four* seats for adults, a *four*-cylinder engine and a four-speed gearbox. In short it would be a proper car and not a motorized pram.' Experience with the old Minor had reinforced Issigonis's belief in the nose-heavy car. The Minor had its engine placed well forward above the front-wheel axle, rather than behind it as was then more conventional. It handled well, but traction was poor on an icy hill, for instance, because the drive was through the rear wheels. In 1948 when the great need was for cars of any sort it was not possible to introduce a new system of front-wheel drive for production Minors, although Issigonis had experimented with front-wheel drive in a trial version of the Minor. The results were gratifying, so the choice of front-wheel drive for the Mini was inevitable. In a conventional car about 55 per cent of the weight is on the front wheels and 45 per cent on the back, compared with 70 to 80 per cent on the front in a front-drive car. What Issigonis envisaged and finally built was a completely functional box, about 10 feet by 4 feet by 4 feet of which, lengthwise, 6 feet 6 inches would be passenger space, 1 foot 6 inches for boot, leaving no more than 2 feet for the engine. Since Sir Leonard in the manner of Henry Ford and his black cars had said: 'You can have any engine you want so long as it's on our production line,' Issigonis was obliged to take the A series, measuring 3 feet 2 inches from radiator to gearbox. The only solution to this quart-in-a-pint-pot problem was to mount the length of the engine sideways or transversely between the two front wheels and at right angles to the line of travel. In order to economize still further on space Issigonis used small wheels of 10-inch rim diameter which stopped

large wheel-arches encroaching into the interior. By placing wheels at each corner of the box he eliminated body 'overhang', and this still further improved the handling because the road is engaged over as wide a distance as possible.

Along these lines prototype ADO 15 (it stands for Austin Drawing Office) took shape at Longbridge. The job was done astonishingly fast considering the complex problems involved, and very cheaply too. Basic experimental work cost only £100,000. In July 1957 the design was completed, in October 1957 it went on the road, and covered 30,000 miles before in July 1958 Sir Leonard asked for his first run. The prototype Mini with a slightly smaller frontal area had a remarkable 92 mph top speed. A five-minute drive round the works was enough to convince Sir Leonard. There and then he made the decision of his life: 'Alec, this is it and I want it in production in twelve months.' Somewhat overwhelmed Issigonis replied. 'But, Sir Leonard, this will cost many millions.' Sir Leonard replied: 'Don't worry about that. You produce the car. I'll sign the cheques'

The investment came to £10 million. It was a decision that could have broken BMC. By modern car standards the development and production schedule was rushed, particularly for so novel a design, and the Mini had its full share of teething troubles when it first went on sale. One of them was the two-section flooring, which allowed rain to seep in if there was even a minute defect in the welding. Even so, Mini owners, however much they may have been annoyed, still proclaimed their faith in the car and went on to buy a Mini again simply because it was something so different, refreshing and practical in motoring.

The superb stability and road-holding of the Mini contrast markedly with those of its foreign rear-engined rivals. The Mini-Cooper has won more international rallies than any other car in the world. It is the essence of Issigonis's approach to car design. 'I will not design cars for people who like to leave them outside their front gates.' He believes that the sheer common sense of a sound engineering concept is all important: that sales effort is an appendage and that

styling for styling's sake is to be distrusted. As Oscar Wilde said: 'Fashion is a form of ugliness so intolerable that we have to alter it every six months.' The waste involved in a yearly model change horrifies Issigonis and he sees the Mini lasting well into the seventies. 'I don't pander to public taste. I plan to give people the most practical form of transport and this has a form of its own.' The Mini's simple, uncluttered exterior was about the only practical envelope to place around his design. The Farinas, father and son, were called in to advise on styling, took one look at the Mini and realized there was nothing to do. 'There is no space for styling in a 10-foot car,' says Sir Alec. In conjunction with Issigonis the Farinas kept the styling element of the highly successful BMC 1100 to a necessary minimum. Launched in 1962, the 1100–1300 range had sold 2 million models by mid 1971 and were top sellers in the United Kingdom market, with a 10 per cent share The capacious front-wheel 1800 was 'mucked about a bit' by Sir Leonard, with less happy styling consequences. By 1971 Issigonis-inspired front-wheel-drive cars had topped 5 million sales.

There was no market research for the Mini – had there been the car would never have been born. Market research is only really successful when it shows the trend of existing products. It cannot effectively evaluate the appeal of products not yet in existence. Who indeed could have pre-sold a front-wheel-drive car with so many novel features to the conservative British motorist? Issigonis himself once startled his firm's publicity advisers by declaring in an interview with a financial paper: 'Market research is bunk.' There is a touch of Henry Ford arrogance about the statement, and indeed Issigonis admired Ford's creative genius and autocratic methods. But there is evidence to show that the Issigonis concept – that the engineer really does know best – is coming back into fashion. More and more people, including paradoxically Issigonis himself, see the car as a social evil and a wrecker of civilization. However, it still remains the most practical form of personal A to B transport. So its numbers will grow; but now the emphasis will be on practi-

cability— how to reduce road-crowding, fuel consumption and pollution of the atmosphere—rather than on styling gimmicks and status symbol elements. Other car firms too are now extending the time between major restyling.

If there are changes in the Mini they are likely to be refinements on a basic theme. Issigonis is toying with a yet smaller car that will do the same job in equal comfort. 'There is much to be said for small cars in crowded traffic. When traffic is moving slowly the space between vehicles is greatly reduced, and a Three-Metre car, according to researches we have carried out, can almost double road-carrying capacity. The same applies at a roundabout.'

Issigonis has always thought about the car and its impact on environment. He is fascinated by the steam-engine which is relatively pollution free and indeed rather wishes he had been born in the era of George Stephenson. In his garage he has built dozens of miniature steam-engines, and a fixed track of his own design runs between overgrown foliage and shrubbery in the garden of his Birmingham house. But the problems the steam car poses before it can become a practical proposition are formidable. For one thing how is it possible to carry enough water even supposing much of it is recirculated? 'Even more difficult is automating the entire process Remember that the steam locomotive had the loving care of two skilled and experienced operators -a driver and fireman who practically knew each engine's idiosyncrasies. You cannot require this specialist knowledge or anything like it for a mass-produced car.' Though he has now formally retired his mind is still active on the car of the future.

Chapter 30

OLD VEINS . . . NEW BLOOD

Ships—building them, sailing them, caring for them—are as fundamental a part of the British way of life as pubs, football and fish and chips. Shipbuilding has been held, by Britain's critics, to typify the national decline from pacesetting innovator to a very poor third or fourth in the world league. In the great yards on the Clyde, the Tyne, the Tees, Merseyside, at Barrow and Belfast the slackening tempo has been used as an example of all that is wrong with Britain. Therefore no industry is more appropriate for a soul-searching reappraisal than shipbuilding. It is, in a way, Britain in miniature, with the faults, the virtues - and the genius too—of the British character.

Is not shipbuilding an old-fashioned industry, riddled with ancient, irrelevant crafts; bedevilled by demarcation disputes; managed by bowler-hatted, watch-chained individuals who belong to the Victorian age and probably believe they are still living there? Are not British ships, when foreigners incautiously order them, invariably late, far too expensive and built to last for ages longer than their usefulness?

Such is the one-sided view of too many glib critics. The facts are these. The pattern of demand from the mid 1950s on favoured Japan. With the closure of the Suez Canal in 1956 demand for oil-tankers and bulk-carriers to save shipping space on the Cape route soared. The construction of these large but comparatively simple ships suited Japan's methods of production and her system of ownership. While two-thirds of the value of a British ship is accounted for by outside contractors—engines, furnishings, fittings, steel plates, etc.—most Japanese ships are built by integrated concerns which make sure, for example, that steel supplies are

secured for tankers ordered by foreign owners even at the cost of disappointing domestic customers. No such discrimination operates in Britain, where one customer is as good as another. Paternal discipline in Japanese firms is of course far stronger than in the United Kingdom, and loss of man hours from strikes is minimal. For most of the past twenty years British shipbuilding has been in the top four most strike-prone industries.

In the pioneering days Britain's yards adopted new techniques and markets. Crafts were formed to cope with the work. They endured. They are part of the industrial lumber that England carries for being the pioneer. In one yard alone —the Govan Shipbuilders – there were in 1965 no fewer than 500 trades: plenty of scope for bitter arguments between unions jealous of their power and prestige, but by 1968 the number of trades had been reduced to seven.

Japan's lead in *value* is nothing like the 4–1 margin she holds in total tonnage over the United Kingdom. One 250,000-ton tanker is worth a lot less than ten 25,000-ton passenger ships. As the pressure of Japanese and German competition has increased—the Germans benefiting from the reorganization of their whole labour structure, thereby eliminating demarcation disputes—so Britain's shipbuilding has responded to the challenge. The Geddes Committee, chaired by Dunlop chairman Sir Reay Geddes, issued in 1966 a sympathetic, closely reasoned and sensible report calling for rationalization. The result is that Britain's big shipyards have now been concentrated into seven major geographical groupings.

On the labour front, the boilermakers (headed by the tough, explosive union leader Dan McGarvey who once declared 'this is a tough industry, with some tough employers in it and we have got to be ready to match them') persuaded the shipwrights, blacksmiths and structural workers to amalgamate with them in a single organization. This was a vital step in reducing the number of inter-union disputes about work-sharing—the most common cause of strikes.

In Whitehall, too, reform was stirring. Sir John Hunter,

chairman of Swan Hunter and one of the industry's most dogged optimists, had warned against a run-down of our merchant navy which would 'have us increasingly at the mercy of foreign carriers; our freedom of action will be lost, our economy undermined and our standard of living, indeed our very existence, threatened'. An island which exports 20 per cent of its gross national product and imports still more, which lives by sea trade and conducts it for itself and for many others, could not ignore such a warning.

Successive governments have introduced measures to help shipbuilding face the subsidized competition of the Continent and the especially favoured rivalry of Japan. A cheap credit scheme was introduced. Then a Shipbuilding Board was established to aid modernizing processes. It has done much valuable work, though sometimes at the expense of propping up inefficient yards. But State subsidies alone will not save an industry. They merely provide a featherbed when the need is for a springboard.

Happily the industry has realized that salvation is in its own hands. One by one the yards have geared themselves to fresh efforts. The amount of money spent on research and development has trebled over the past ten years. Vickers spent £1 million to build the largest dry-dock on the north-east coast. Swan Hunter installed the world's first fully automatic machine for cutting steel plates. The size of ships which British yards could build rose from 100,000 to 1,000,000 tons.

The Productivity Council found that at Swan Hunter the company had cut the time taken to build a ship by one-third in three years. The immensely complicated Polaris nuclear submarine programme was completed ahead of schedule. While some old family concerns, such as Short Bros of Sunderland, where all nine grandsons of the founder were concerned in the business, closed down, others flourished mightily. Scotts of Greenock, for example, which has been in family hands for 250 years, set profits surging in partnership with Lithgows. Both on the Clyde and the Tyne firms offered 'off-the-peg' standard ships at cut prices to win custom. So

did very small yards, notably Clelands of Wallsend. But the most spectacular success was gained by Austin and Pickersgill of Sunderland.

During the war 2,700 tramp vessels, named Liberty ships, had been constructed in America. By 1966 some 700 of them were still afloat, but obviously coming to the end of their service. Austin and Pickersgill designed a 14,000-ton shelter-deck vessel as a replacement, the SD14. Within four months of announcing the design the firm had won four orders. By 1970 more than fifty had been ordered, with many more being built under licence overseas. On this standard-type ship the Japanese were pushed into second place.

Hawthorne Leslie saw growth prospects in liquefied gas. The firm started research work in 1961, and by 1966 had solved the problems sufficiently to launch its first custom-built liquefied petroleum gas-tanker, *Clerk Maxwell*, for the Ocean Gas Transport Co. The vessel can carry propane, butane and ammonia in three insulated cargo tanks at sub-zero temperatures. The main problem with the transport of any gas is the vast bulk. Hawthorne Leslie's answer was to cool the gases so that they turned liquid and shrank in volume. Success with the venture led to the company getting orders for two gas-carriers for Mexico. Then the firm worked out design specifications for carrying all the petro-chemicals. It thus became a world leader in this specialized field.

As the seventies opened Sir John Hunter announced that his Swan Hunter's yard now had orders on its books worth over £200 million. 'Not bad,' he exulted, 'for an old broken-down industry.' Indeed it was not. Gradually British shipbuilding is taking a new shape. Whether victory crowns its efforts is dependent as much, perhaps more, on world circumstances as on its own merits.

Chapter 31

MEDICINE

Britain has been and still is an outstanding contributor to the world pool of medical knowledge. The face of the modern world and the size of its population—have been drastically changed by such British drugs as penicillin and such discoveries in tropical medicine as the link between mosquitoes and malaria. Historically speaking no country can boast more 'father figures' of medicine: in the seventeenth century William Harvey, father figure of English physiology, discovered the circulation of the blood; in the eighteenth century John Hunter was the first of the great pioneers of modern surgery; in 1796 Edward Jenner first successfully vaccinated a boy against smallpox. With the dawn of scientific medicine in the early part of the nineteenth century Sir Charles Bell became perhaps the greatest medical researcher since Harvey, with his discovery that there were two kinds of nerve, sensory and motor. The world of medicine still uses the names of famous nineteenth-century British physicians to identify the diseases they first diagnosed, Richard Bright (renal dropsy), Thomas Addison (adrenal deficiency). A Scots professor of midwifery, James Young Simpson, was the first to use chloroform as an anaesthetic in 1847. Anaesthesia and antisepsis, first used by Joseph Lister in 1865, were the twin pillars of the great Victorian revolution in surgery. Lister, who became the first medical peer, invented sinus forceps and probe-pointed scissors still in use today. He also pioneered the rubber drainage tube; Queen Victoria, adventurous in medical matters, was the first of his patients to use it in 1871, just as in 1853 she had been one of the first to use chloroform. The Victorian Edwin Chadwick spread 'the sanitary idea' to the public water supply and drainage with dramatic effects on the public health.

There was a still more dramatic impact on world death rates in the twentieth century as a result of two key British discoveries in the field of tropical medicine.

At the turn of the century Sir David Bruce showed that the tsetse fly was the carrier of sleeping sickness. The disease has now ceased to be a major scourge in Africa. At the same time Sir Ronald Ross demonstrated the connection between mosquitoes and malaria. Since then, and in no small measure due to British discoveries and initiatives, malaria has been decisively defeated in large areas of the world. The investigations of Sir Robert Robinson (Nobel Chemistry Prize, 1947) into the structure of important plant substances, such as the alkaloids, led to the successful production of several anti-malarial drugs.

Synthetic insecticides and anti-malarial drugs such as ICI's highly successful Paludrine (introduced in 1945) as well as more recent additions such as the Anglo-America Daraprim have had spectacular results. Places like Cyprus, Guyana, Singapore, Mauritius, Sarawak and most of the islands of the Caribbean, once infested with malaria, have now all but eradicated the disease.

In the last thirty years medicine has probably advanced more rapidly than in the previous 300 years, and at the heart of this revolution has been the use of new drugs, notably penicillin. As one might expect from a country which spends so much on research and development (£160 million by the central government alone) Britain has played a major role in putting important new drugs into the hands of doctors. The British pharmaceutical industry's production has grown twenty-fold since before the war. Expansion since the war has been sixfold and the industry is now growing at the rate of 8 per cent a year. In 1969 its sales were £330 million, of which £118 million was exported. In 1970 exports at £127 million exceeded National Health Service sales for the first time. The upward surge in pharmaceutical exports is even faster than the growth of the industry generally, and it has largely been made possible by the large sums, about £20 million annually, now being spent on research. The industry

now has a higher proportion of scientific staff than any other in the country. Excellent work has, of course, been done by government-funded laboratories, notably the Medical Research Council with some seventy-seven research units, including a large centre at Mill Hill, North London. But some of the greatest achievements, like that of the Beecham group in developing semi-synthetic penicillin, have come from expensive research financed out of private enterprise profits.

By contrast State *monopolies* of medicine and research have not proved fruitful (indeed it is one of the strengths of the MRC that it has full control of its own funds). As Sir Derrick Dunlop, chairman of the Medicines Commission, has noted: 'Since the October Revolution the great State-owned industry of the USSR has not produced a single new drug of therapeutic importance.'[1] Undoubtedly competition has proved an enormous spur to research and the production of new and beneficial drugs. The highly volatile and competitive state of the drug industry can be seen from the sales patterns of leading National Health Service suppliers. The leader in 1969 was only in fifth place in 1962. Conversely the leader in 1962 had sunk to thirteenth place in 1969 and the No. 2 company in 1962 had slumped to twenty-ninth place. Thus in the pharmaceutical business economic survival depends on the development of new and effective drugs which can be patented and will, it is hoped, remain therapeutic leaders in their field for a number of years.

The cost of producing a new drug can be considerable, £2 million or more, but equally the rewards can be golden, as the Beecham group discovered. This long-established British company, makers of famous food and toilet preparations, as well as popular proprietary medicines, had done little pure research into drugs until after the war. Then, on the advice of Professor Sir Ernst Chain of penicillin fame, it embarked on an expensive research programme to create penicillins with a broader spectrum of anti-bacterial activity than the early penicillin and which would prove effective against the

1. *The Times*, 9th November 1970.

penicillin-resistant germs like the staphylococcus then beginning to cause alarming infections, particularly in hospitals. All penicillins, like earlier types of the drug cephalosporin, start from a natural mould organism.

To make a semi-synthetic derivative it is necessary first to break natural penicillin down to its essential building-block, the nucleus. With cephalosporin this can be done chemically, but with penicillin, which is much more unstable, it was necessary to use gentler acting enzymes. Once the nucleus has been isolated it is possible to add side-chains to provide in effect a whole range of new drugs. Beecham made the important breakthrough of isolating the penicillin nucleus in 1957. Techniques for extracting the nucleus in its pure form were improved: different side-chains were added to the nucleus, thus providing new compounds or varieties to deal with a new range of bacteria. As with cephalosporin a few years later these compounds were evaluated in the laboratory for their antibiotic power; the more effective were tried on animals and, when adjudged safe, on human beings. This led to the marketing of a powerful oral penicillin, Broxil, in 1959. The following year came the all-important remedy for penicillin-resistant staphylococcus in Celbenin, 'a major event in chemotherapy', said the *Lancet*. In 1961 came Penbritin, an outstanding semi-synthetic penicillin which can be taken orally and kills a very wide range of bacteria, and in 1962 a still more powerful anti-staphylococcal drug, Orbenin.

In the decade following the isolation of the penicillin nucleus the company spent over £10 million on research (compared with a quarter of that amount in the previous decade). New and improved penicillins are now being produced all the time, of which one of the latest, Floxapen, is about twice as effective as similar antibiotics.

In 1972 came yet another powerful new broad-spectrum antibiotic Amoxil, an ampicillin or penicillin-type variation, which proved especially useful in reducing the toll of chronic bronchitis Chest infection can often be damped down with conventional antibiotics only to recur a few days later, but with Amoxil the infection stopped recurring. Besides being

effective at much lower doses than most other antibiotics a daily dose of the drug costs only about a third (or less) of a daily dose of cephalosporin.

Whereas many antibiotics like streptomycin have had toxic effects, penicillin and its semi-synthetic developments have proved themselves the safest powerful drugs ever discovered. Beecham's now sell semi-synthetic penicillins to over a hundred countries. Yearly export sales of it exceed £14 million and royalty income from foreign licensees is more than £4 million. In 1971 the Royal Society awarded its Mullard Medal to four of the men principally responsible - Dr Ralph Batchelor, Peter Doyle, Dr John Naylor and Dr George Rolinson. 'One of the most significant advances in the chemotherapy of bacterial disease in the last decade,' declared the Royal Society.

Before the advent of synthetics the war-time success of penicillin had inspired much searching for new moulds with healing properties. Scientists sought to find antibiotic gold in some fairly murky Klondikes, from soil samples to effluent. Among them was the Italian professor Giuseppe Brotzu, who monitored sewage off the coast of Sardinia. From the effluent discharged by the good citizens of Cagliari, Sardinia, the professor isolated an interesting fungus identified as cephalosporium, which he found to have distinctive antibiotic properties. Lacking facilities to purify and produce the active ingredient himself, in 1946 he sent a report to a British ex-Army health officer he had known in the war, Dr Blyth Brook, who in turn contacted Sir Howard Florey at Oxford.

This set in chain an intensive period of research at Oxford by Professor G. P. Abraham and Dr C. G. Newton, in which two types of antibiotic were extracted from the fungus. In 1952, when experimental work showed promise, the National Research Development Corporation acquired world-wide patent protection and gave financial support. But it was not until 1955 that an effective antibiotic, Cephalosporin C, was isolated. Animal experiments showed it to work against penicillin-resistant staphylococci and other bacteria, but it

proved difficult to make enough of the substance for research purposes, let alone to produce in concentrated form for the mass market. It seemed like the story of penicillin all over again, and in a sense it was, except that this time the NRDC patents assured Britain of a share of any eventual profits. Government and university experimental work had gone smoothly, but new development required the resources of the big drug firms, and two, Glaxo in Britain and Eli Lilly in the United States, were licensed to engage in the work.

Samples of Cephalosporin C were made available from Oxford, but it still took several years before an efficient method was found of isolating the nucleus and producing more efficient synthetic strains. By the autumn of 1964 mass-production techniques were in operation. 'A major triumph for the British pharmaceutical industry,' declared Glaxo. It was also an interesting example of international co-operation and of teamwork between the Government, university research and the industry. At the moment, of the many hundreds of varieties of Cephalosporin made in laboratories, four are currently being marketed, two for oral use and two injectable. Cephalosporin has a large share of Britain's fast-growing antibiotics export market.

Bacteria are wily organisms which soon learn to defend themselves by producing enzymes that destroy the antibiotic that would otherwise kill them. Staphylococcus and tuberculosis are both adept at this; for instance, staphylococcus produces the enzyme penicillinase which could split the old penicillin molecule, thereby rendering it ineffective. But by constantly producing synthetic variants, medicine in its perpetual battle with bacteria usually manages to find the remedy and stay a step ahead in this weird game of 'molecular roulette'.

The high cost of success in the competitive drug field is demonstrated by ICI's pharmaceutical division. The firm's early successes included a valuable new sulfa drug still widely used and major advances in the treatment of tropical diseases such as leprosy as well as malaria. It is active in antibiotics, makes the world's most widely used inhalant

anaesthetic and has developed a group of drugs to cope with different forms of hitherto hopeless heart complaints Exports account for 70 per cent of the division's output. The price of its growing share of the world drug market is a heavy research bill £3,500,000 in 1970, rising to double that figure in the mid seventies.

One of the most exciting drug discoveries of recent years is Fisons' new asthma drug Intal, which offers fresh hope to millions of people all over the world whose lives are curtailed or rendered miserable because of allergic asthma. There are an estimated half a million sufferers in Britain alone. Unlike other asthma drugs, which by dilating the bronchial tubes offer short-term relief after an attack has started, Intal is a preventive. Asthma sufferers once confined to bed in the pollen season can now move about freely through pollen-filled air if they take Intal several times a day. Intal, chemical name disodium cromoglycate, stops the body overreacting to the particular stimulant that sets off the asthma attack.

The drug is inhaled as a powder, from a special tube called a spinhaler, in which a small propeller mixes the dust with air With careful instruction a child as young as five can use the spinhaler for itself. The patient, sucking from one end of the spinhaler, gets the minute particles of the powder right down the throat and into the lungs. It seems to act on the individual cell, stopping it from secreting the chemicals which bring on asthma.

The background to the drug's discovery is a romantic one. Since ancient times a weed growing wild in the Middle East called khellin was known to have medical properties beneficial to asthma sufferers. Fisons' chemists analysed khellin seeds, isolating a number of compounds from which they synthesized new chemicals. One of these was Intal. Ironically it belongs to a different group from the anti-asthma constituent in khellin and acts in a different way; so in a sense Intal was one of those accidental discoveries where pursuing a promising path leads to a different but equally desirable destination. It could be called luck, like the penicillin spore that landed on Fleming's culture plate, but as Fisons' direc-

tor of research Dr James Cox says: 'It is customary to think that many discoveries are almost entirely due to accident keen observation of an unexpected incident is probably nearer the truth.'

Most of the credit must go to the persistent research of one man, Dr Roger Altounyan, a former fighter-pilot, who took up medicine after leaving the RAF. Altounyan is a chronic asthmatic, and with great courage and even more patience he used himself as a human guinea-pig to make the first potentially risky experiments with the unknown drug. He gave himself many artificially induced asthma spasms, and in all he tested hundreds of synthesized compounds, searching for the best. It meant living an iron routine in which every Monday to Thursday had to be identical so as to gauge accurately the results of his experiments. The breakthrough came in 1965, when a synthesized compound called FPL 670 was found to have high activity. This was soon to be given the carefully chosen name of Intal—which is shorthand for 'interferes with allergy'. The much abused term 'wonder drug' is not in this case an exaggeration. It is an especially effective drug in the types of allergic asthma prevalent among children and has the immense advantage of safety -unlike certain inhalants and steroids which can be dangerous or even lethal.

Intal is now sold in all the major countries of the world including the U.S On the Continent Intal is known as Lomudal. Its earnings have transformed Fisons, best known as fertilizer manufacturers with a drugs sideline, into one of the world's major pharmaceutical groups. Indeed the drug side now contributes half Fisons annual profit of £11.26 million in 1973.

Though man's war against bacteria has been a highly successful one, viruses, unlike bacteria, are not affected by antibiotics As the smallest known parasites, viruses multiply inside living cells. Antiseptics strong enough to kill them would damage cells, so for the moment prevention by vaccine rather than cure is the principal defence, as with the polio vaccine. Unfortunately there are so many different

types of virus—over 200 in the case of the common cold alone—that it is impossible to guard against any but a small proportion.

But there are promising developments on the virus front. One of the most fruitful was opened up by the late Dr Alick Isaacs at the National Institute for Medical Research at Mill Hill. In 1956 Isaacs and Dr J. Lindemann discovered that cells attacked by a virus produce a protein substance, interferon, which can kill the virus. If quantities of interferon could be isolated, purified and produced it seemed the perfect answer; in effect it would mean using the body's own anti-viral defences, but greatly reinforced by an outside dosage. Large batches of interferon were prepared from chick tissues at the Government Microbiological Research Establishment at Porton. Unhappily interferons are very specific to species; just as chick interferons will cure only poultry, so human interferons are necessary to cure man. Since it is not easy to cultivate human cells outside the body, supplies of interferons are necessarily limited. In addition, clinical trials with interferons have been somewhat disappointing. But arising out of Dr Isaac's discovery is a much more hopeful line of advance, which is to stimulate people to make their own interferon; it has been proved that certain nucleic acids will do this. They are known as interferon inducers and are not species specific; now research into them is going on all over the world.

In 1960 the present director of the National Institute for Medical Research, Sir Peter Medawar, won the Nobel Prize for Medicine with the Australian, Sir Macfarlane Burnet, for his work on tissue transplant, which paved the way for the spectacular transplant surgery of the late sixties. In the experiments undertaken by Medawar and his colleagues, living spleen cells from a mouse of one strain were injected into the veins of a new-born mouse of another strain. Six weeks later, skin from the first mouse was grafted onto the other mouse and the graft survived. Had it not been for the injection antibodies would have formed and destroyed the graft within ten days of transplantation.

What this demonstrated was highly significant. In the normal way the body rejects foreign substances; this is a necessary defence against the myriads of germs that surround us. However, this immune or intolerant response to foreign substances is an obvious barrier in transplant surgery. Sir Peter's genius was to prove the existence of immunological tolerance and the fact that it could be induced by injections. Besides the surgical implications Sir Peter's work has been a valuable tool in genetics and cancer research For some types of cancer, at least, would seem to result from a breakdown of the body's immune response. A word should be said about the personal courage of Sir Peter, who at the height of his career in 1969, was stricken by a blood clot on the brain. For a time unable to move, he has fought back to start work on a new project studying the lining of blood vessels which could provide reasons for the disease which struck him.

Despite numerous discoveries about the structure of the cell and the way it reproduces itself, cancer, which involves the uncontrolled duplication of cells, remains a mystery. This is not to say it cannot be combated; it can be, and most effectively. Cancer is not necessarily a fatal disease or a death sentence. Some of the greatest benefits to date have been in improved diagnostic techniques. In testicular cancer, which used to be rapidly fatal, deaths are now rare given early diagnosis and prompt treatment with drugs and radiotherapy.[2] Early treatment gives a 70 to 74 per cent survival rate for cancers of the breast, womb and larynx. (Compared with only 5 per cent to 10 per cent if treatment begins at a late stage.)

No branch of medical investigation is more completely international than cancer research. Results and discoveries wherever made are readily disseminated throughout the world for humanitarian reasons and to avoid wasteful duplication of effort. But although results are internationally

2. Professor Theodore Crawford of the Cancer Research Campaign's Scientific Committee at a London Press Conference, 23rd June 1970.

shared, the research process itself even in the United Kingdom is split up among many working units. Since research into cancer is still a journey into the unknown, with the routes uncharted and the destination uncertain, this fragmented approach is almost certainly the right one. It has led to important breakthroughs from widely scattered sources. One of these was the work of the British doctor Denis Burkitt in first observing in 1958 a particular kind of malignant tumour in the jaws of African children, most commonly between the ages of six to nine. It is known as Burkitt's disease or Burkitt's lymphoma. The geographical distribution of the disease in tropical areas was seen to match closely the area of certain disease-carrying insects, like the mosquito. All the studies pointed to the tumour being caused by a virus infection, the strongest evidence yet that certain human cancers could be virus-caused.

Burkitt's discovery was rapidly taken up all over the world. Its implications are immense. For where a cancer has a specific virus cause it should be possible to develop a vaccine which will provide immunity against certain forms of cancer. Professor Theodore Crawford of London University has predicted that the day of cancer vaccines is 'not too far off. It could be that viruses might provide the key to unlock the fundamental mystery in cancer, the mechanism of malignancy'.[3] Great strides have been made in cancer immunology in the last decade—and even greater strides in the cures affected. Only twenty years ago choriocarcinoma, a cancer of the placental tissues in the womb, was always fatal. Ten years ago only half the sufferers survived. Today the survival rate is 84 per cent. Many other forms of cancer, ovarian, uterine, even gastric and lung cancers, show improved survival rates. So does leukaemia, where again viruses seem to be involved; in the 1940s the average survival time was only two to three months, now with the combination of drugs this has been increased to thirty-two months, with the possibility of a complete cure.

One of the most effective treatments for leukaemia, which

3. *loc. cit.*

owes much to the Defence Ministry's Microbiological Research Establishment at Porton Down, Wiltshire, is a substance called asparaginase, an enzyme originally extracted from guinea-pig serum in the United States. By accident it was found to have an anti-tumour effect on mice, and when tried on human beings it proved effective in arresting certain types of acute leukaemia. Porton, once the Government's germ warfare centre, but now being 'civilianized', was able to make a much purer form of asparaginase by using an extract from a plant rather than from guinea-pig serum. Porton's asparaginase is more effective and, being purer, has fewer side-effects. Asparaginase works by starving the leukaemia cells of their essential nutrient, a substance called asparagine, which these cells normally pick up from the bloodstream. Asparaginase converts the asparagine in the bloodstream into something different, of no use to the cancer cells, which then rapidly die. But normal cells, which make their own asparagine, are quite unharmed. So here is an anti-cancer drug which in its Porton form has no toxic effect. It is a useful advance in cancer treatment.

Immunotherapy is also being used with success in the treatment of leukaemia. After drug treatment patients given a course of weekly injections with dead leukaemia cells from other victims have survived three or four years. Professor Peter Anderson of the Institute of Cancer Research who conducted a four year controlled trial with 139 patients concedes that though the treatment is not a cure it is an effective control of the disease.

The situation with cancer is not unlike that with TB a generation or two ago. In an earlier generation treatment of TB at first merely prolonged life; then with better drugs and better use of them came the cure; finally came prevention. Says Professor Crawford: 'This is what will happen with cancer.'

Progress seems slow, but today's research is the basis of the next decade's practical advance. In all these developments the British contribution has been outstanding. Britain's two largest voluntary bodies, the Cancer Research

Campaign and the Imperial Cancer Research Fund, spent £3 million a year between them, and the Government spends another £2 million on cancer research. In November 1970 the ICRF announced a new cancer drug which in tests on mice has had the remarkable effect of preventing the spread of secondary cancers from a primary source. The drug, known as ICRF–159, was originally used on child leukaemia sufferers. It is not a cure for cancer itself, though it retards the growth rate of the primary cancer, but if the primary cancer can be isolated and prevented from spreading, the chances of a neat and complete removal by surgery (or radiation) are greatly increased. According to Dr Kurt Hellman, head of the ICRF's chemotherapy department, the drug appears to work by preventing the release of malignant cells from the blood-vessels of the primary tumour.

Clinical trials must now prove that what works in animals will work in human beings too. Often this is not the case, but Dr Hellman is hopeful because the spread of cancer in animals and man is a similar process, more alike than individual tumours in man and animals.

Of course medical science can go only so far in the prevention of cancer. The social aspect of health, what Chadwick called 'the sanitary idea' when he was preaching the need for better drains, is as important now as it was in Victorian times. In the last resort the health of the nation depends on the habits of its people. Smoking causes some 30,000 of the country's 120,000 annual cancer deaths. The Medical Research Council's chief statistician Professor Richard Doll was the first man to establish the link between cigarette-smoking and cancer and his work has been used and quoted all over the world. In his view a big step in making cancer preventable in future will be identification of all cancer causes such as radiation, pesticides, cigarettes, chemicals and drugs and then ridding the environment of them.[4]

With another medical expert, Dr Martin Vessey, Pro-

4 An address to the International Cancer Congress at Houston, May 1970.

fessor Doll also led the way in pinpointing and quantifying the dangers of the Pill, and in particular the dangers of blood-clotting. Professor Doll is philosophical about the Pill and is against banning it: 'If you know that something does good in man, then it is unwise to ban it on the basis that it may do harm.'

In the operating theatre Britain can point to outstanding achievements, particularly in plastic and heart surgery. Sir Robert Jones, who died in 1933, was one of the creators of plastic surgery, and the legendary Sir Archibald McIndoe, with his war-time 'guinea-pigs', many of them aircrew horribly burned, became the most famous plastic surgeon of all time. The first kidney transplant operation was at Leeds in 1963, and in this field of transplants British surgeons have achieved a high and improving degree of success.

The first man to operate with consistent success on the inside of the heart was the world-famous London heart surgeon Russell Brock (in 1965 Lord Brock). It was at Guy's Hospital in 1948 that Brock, a tough-minded and original thinker, first gazed on the inside of a human heart pulsating with life. His patient, a young girl, blue of skin from the age of six months, had never been able to walk. She stood with a crouch because standing upright was too fatiguing. This was because of an obstruction of the valve of the heart. After the operation, in which the valves were dilated, her skin became pink and she was able to run. Brock performed the operation hundreds of times, and since then the world has known many thousands of such 'blue-baby' operations; also 'hole in the heart' operations, where an abnormal hole exists between the chambers of the heart.

Though it all seems commonplace today it was a surgical revolution, a near miracle, in the days immediately after the war. For it had been a long-standing belief until Brock that the heart was untouchable surgically, and indeed some unhappy pre-war operations in America seemed to confirm this belief. But Brock weighed the advances in transfusions and anaesthetics since those early failures. He had examined too

many hearts post-mortem in patients who had died of valvular disease and seen the minute size of the orifice through which the whole life-blood of the person had to be squeezed. His conclusion: 'This simple mechanical obstruction must be capable of relief by surgery.'

Brock's first operations were on the wet pulsating heart; this cut the scope of heart surgery. More sophisticated heart operations required access to a bloodless, motionless heart. One technique was hypothermia, the so-called 'deep-freeze' operations on the heart where the patient is cooled to temperatures of 30° C. and in some cases very much less. In normal conditions the blood supply to the brain must not be interrupted for more than a minute or two, otherwise cerebral anoxia (oxygen deficiency) will cause the brain to die. But if the body is cooled the brain needs less oxygen, so the surgeon can work on a dry, still heart for ten minutes or more without danger. Recovery is achieved by rewarming and starting the heart again, if necessary with an electric shock.

The Melrose NEP heart-lung machine has been another remarkable aid to heart surgery. An alternative to hypothermia is to keep the circulation flowing but to by-pass the heart and lungs completely. The problem was to get sufficient oxygenation of the blood. This was a problem that obsessed Denis Melrose, a young doctor at the Postgraduate Medical School of Hammersmith Hospital (now the Royal Postgraduate Medical School). In 1949 Melrose, who had been an ear, nose and throat surgeon in the Navy, decided to throw up his dreams of moving into a Harley Street consultancy and owning the inevitable Rolls-Royce. 'I couldn't stand ear, nose and throat surgery—taking out tonsils, clearing up messy sinuses—so I decided to go back to school and do some real research as a physiologist,' he recalls. Four years later, when still only thirty-two, Melrose designed a heart-lung machine that would spread blood in very thin films over a large surface area, thereby exposing as many as possible of the oxygen-carrying red cells directly to oxygen. Tests with animals demonstrated its efficiency and it soon

became a valuable part of human heart surgery. Melrose demonstrated his work in America and paid a spectacular visit to Russia in 1959, where a British team performed 'hole in the heart' operations on little Russian girls. The machine has been greatly improved over the years and it can now be used in conjunction with hypothermia equipment. It is in use in many centres in Britain and overseas.

Melrose, now professor of surgical science at Hammersmith, led the team which produced another big development – the inclusion in the heart-lung machine of a silicone rubber membrane ten times thinner than human hair. The blood absorbs oxygen through the membrane without coming into direct contact with it. In effect, the membrane mimics the function of the alveolar membrane in the lung, through which the blood absorbs its oxygen. But with the old style of oxygenator, the blood, in direct contact with oxygen, starts to deteriorate and this imposes a four- to six-hour limit on heart surgery. 'Sometimes we need to spend longer. Still more important the heart, often after very tricky surgery, has to resume its full workload immediately,' explains Melrose. 'This is rather like operating on a fractured femur and asking the patient to get up and walk on it straight away.' With the new membrane the patient could stay on the heart-lung machine for several days. The silicone membrane itself was developed by a young Canadian working at Hammersmith, Dr Nora Burns, who succeeded, as do many researchers, partly by accident when one of her membrane samples was 'cooked' for too short a time. This helped to produce the very fine effect required.

Another technique pioneered by Melrose and his colleagues was that of elective cardiac arrest, by introducing a minute quantity of a chemical called potassium nitrate into the bloodstream, which simply stopped the heart. The heart can be restarted by washing the chemical out of it. 'In effect you kill it temporarily. That at any rate is the legal position. I shall always remember the first time we did it in 1955. One or two people wondered if we knew what we were doing. Fortunately we did.' Elective cardiac arrest by various

newer means is now a well-established procedure in heart surgery.

An operative technique for disease-damaged hips devised by John Charnley at the Wrightington Hospital at Wigan has achieved a remarkably high success rate, and his method is now being used in two major United States medical centres in New York and Hollywood. The head of the femur is like a ball which fits into a socket in the pelvis. Fitting an artificial steel ball-and-socket type of hip joint to an arthritic hip may seem in principle to be a fairly simple mechanical operation. In practice there have been considerable hazards: firstly a fairly high degree of infection, as much as 4 per cent because large areas of the tissues have to be exposed; secondly, there was the danger that the artificial joint would break or develop a rough, worn surface, as many used to do, often disastrously soon, and with extremely painful consequences for the patient.

To start with Charnley improved the method of attaching the steel ball to the femur. The ball used to have a shaft with a thread which was screwed into the femur, and this sometimes worked loose. By using a dental 'cement' called methyl methacrylate he was able to implant the ball and shaft into the femur securely and firmly. The ball rotates in a socket and this too used to be steel, but the body fluids often proved an inadequate lubrication for a steel-to-steel joint. Plastic would be better, thought Charnley, but plastics that he tried broke or wore too soon. Then Charnley tried a high-density polyethylene and the wear rates were fantastic. The new plastic socket, only 10 mm thick and also attached by the same dental 'cement', wears at only 1 mm in five years and should last for at least a quarter of a century before any discomfort due to wear is felt. Then it can always be replaced. Charnley's other innovation was to equip his surgical team with space-suit style apparatus whereby exhaled breath is drawn away in a tube. The infection rate has been cut to a remarkable 0·5 per cent, and surgeon Charnley and his team, who operate six times a day, four

days a week, have over 8,000 patients returned to normal pain-free movement.

Some equally remarkable work in developing artificial finger joints has been pioneered at Hammersmith's Royal Postgraduate Medical School. It is estimated that some 30,000 people, principally sufferers from rheumatoid arthritis, can benefit from the finger joints which are in effect tiny little strips of plastic. Once these are inserted a patient's life is transformed. A woman who could no longer sew—or even drive a car for long without real pain—found she was able to do both these things. Her deformed hands began to resume their original shape and she was able to wear a wedding ring for the first time in several years. Patients unable even to dress themselves now live normal lives again. There is no rejection problem and doctors at Hammersmith are now working on replacing elbow joints. More and more patients are benefiting from these advances—each one a living tribute to the progress of British medicine.

Chapter 32

'SIR MOULD'

Penicillin, beyond a doubt, has been the world's greatest life-saver, and it all began, as practically every schoolboy knows, with a speck of fluff. One September morning in 1928 a natural penicillin spore landed on a plate of jelly being used for germ culture on the cluttered workbench of Professor (later Sir) Alexander Fleming's laboratory at St Mary's Hospital, Paddington According to Sir Alexander it just flew in through the window. Later the spore formed a fluff-like mould on the culture plate and wherever it grew and multiplied so the germs, in this case the virulent staphylococci, were made to retreat. The mould established a *cordon sanitaire* around itself and the germs. But what a rare and beneficial accident, a chance in a million, that this unknown spore should have drifted through the window. In fact, as we must now accept, Fleming's story is at fault. It belongs to the great mythology of science, like James Watt thinking of a steam-engine by watching a boiling kettle.

As one of Fleming's associates, Professor Ronald Hare, points out,[1] no good bacteriologist, and Fleming was a superb laboratory worker, would have risked contamination by working on culture plates with a window open—least of all with a laboratory overlooking busy Praed Street and adjoining the steam, dirt and puff of Paddington Station. 'The windows were seldom if ever opened . . . the room would have been too noisy.' Moreover Fleming was too small a man to have opened either the lower or upper panes of the window without first climbing on the bench. This would have meant shifting large numbers of plates every time he wanted to open or shut the windows. Hardly convenient. There was the added hazard that some of Fleming's danger-

1. *The Birth of Penicillin.* Allen & Unwin, 1970; page 81.

ous microbes could themselves have drifted out of the window onto passers-by. According to Professor Hare the penicillin spore almost certainly came up the stairs and through the door. For on the floor immediately below in a somewhat makeshift laboratory another scientist was working on moulds collected from the homes of asthma sufferers. The spores of penicillin are so light that they can easily be carried on a current of air and in the normal way work should be done on them under a hood or in a fume cupboard. But the makeshift nature of the laboratory did not allow this -and Fleming's door on the floor above was almost always left open. Tests on the other scientist's moulds later revealed one that showed precisely the same characteristics as Fleming's penicillin. However, nothing detracts from Fleming's achievement in having at once perceived the significance of his discovery.

Fleming came from an Ayrshire farm, and was one of eight children. After a frustrating spell as a clerk in a shipping office a small legacy enabled him to enrol as a medical student at St Mary's at the age of twenty in 1901. It was to be a lifelong connection. In 1922 Fleming had discovered the strong antiseptic properties of a substance he called lysozyme, which is found in various human tissues and secretions, notably in tears. Though that delicate mechanism the eye is exposed to the air severe infections are comparatively rare because antiseptic tears flood the eye as soon as a foreign body enters. Fleming had noticed the effect of dropping a human tear on germ cultures. Penicillin, named from the Latin *penicillus*, meaning brush or pencil, after the brush-like tufts of the mould, was even more powerful. It shared too with lysozyme the great advantage that it destroyed bacteria without destroying healthy bodily tissue, as was soon discovered when the mould was made into a broth and injected into animals. Chemical antiseptics, which Fleming had always distrusted since he was a doctor during the First World War, do not have this priceless quality.

Though colleagues were sceptical of the medical application of Fleming's work he proceeded to grow more and more

moulds in plates and to test penicillin by smearing the plates with germs like diphtheria, anthrax and streptococci. These germs did not survive near the mould, though others did, and Fleming drew up lists of those germs which were affected by penicillin and those which were not. It is sometimes held against Fleming that it took over twelve years from the discovery of penicillin to its first effective use on an Oxford policeman in February 1941. Certainly Fleming never lost faith in his discovery, but he faced something of an uphill battle against prejudice and ignorance; nor was he over-endowed with resources. At one time, when he stood on the brink of one of the greatest medical discoveries of all time, he had only two assistants, who had to work in the corridor. Fleming knew that he had cultures in his laboratory that could save thousands of lives. The major difficulty was in developing a relatively pure and reliable penicillin of sufficient concentration.

It was the genius of a forthright Australian from Adelaide, Howard (later Sir Howard) Florey, who became Professor of Pathology at Oxford, and the brilliance of his biochemist Ernst Chain, a refugee from Hitler's Germany, who first produced penicillin in a reasonably stable form as a yellow powder. The amounts were minuscule, but experiments in May 1940 on mice infected with streptococci were dramatic. When the results were published in the *Lancet* on 24th August 1940 Fleming, who had known nothing of the Oxford work, turned up there, and looked at the pinch of powder. 'You have made something of my substance,' he said. Soon the drug was used on humans. Penicillin spreads through the body and can tackle a generalized or purely local infection with no harm to the system.

Though the Oxford policeman, after rallying strongly, was to die when supplies of the drug ran out, others, given up for dead, were successfully treated in the next few months, including one of Fleming's personal friends who had been dying of meningitis.

Clearly penicillin would be a godsend for treating the wounded in war. The difficulty was to make it in sufficient

quantities—and the 'mass-production' techniques at Oxford where the equipment included milk churns and a stirrup pump was clearly not the way. Florey attempted to interest British drug firms, but without success. The cumbersome mould-growing technique using thousands of milk bottles failed to provide enough mould to extract worthwhile quantities of penicillin. Nor could Florey lay his hands on sufficient materials and equipment in war-time, bomb-damaged Britain So Florey went to America with a penicillin strain and told the National Regional Research Laboratory at Peoria, Illinois, all he knew. He did not think to patent the discoveries. At first, even in America, progress towards mass production was slow. Then under United States Government pressure the resources of the vast American drugs industry were mobilized and the Brooklyn firm of Pfizer succeeded in getting penicillin to grow by a process of deep fermentation in large vats. Alas, the British industry, ill-advised by the Ministry of Supply, who would not release as much as 100 tons of steel to make large vats, was restricted to milk-bottle culture. It was useless, and in the end Britain had to pay tens of thousands of pounds in licence fees to the Americans for the privilege of mass-producing Fleming's life-saving drug.

No such mistake was made when Florey began work in the late forties on another British wonder drug, Cephalosporin, which was placed securely under patent and now earns Britain millions a year in export fees and licence (see page 194ff) But what Britain lost from failure to exploit Fleming's discovery has still been the world's great gain.

Chapter 33

TEST-TUBE BABIES

It was in a laboratory in Oldham that an energetic Yorkshireman, Dr Robert Edwards, spotted the first human egg ever to be fertilized in a test tube. It was collaborative research which included Dr Patrick Steptoe, an Oldham gynaecologist, and Barry Bavister in Cambridge. Still not quite certain of how much they had achieved, Edwards and his colleagues embarked on more comprehensive research in a tiny laboratory in Downing Street, Cambridge. One day late in 1968, through one of the huge microscopes on the bench, Dr Edwards and his colleagues saw the detailed proof of their extraordinary achievement. Of the fifty-six eggs used in the insemination experiment eighteen had been fertilized. Now for sure they had created the very beginning of a human life. When the result of their research was published in *Nature* the following February it made headlines all over the world. This was the first step towards a test-tube baby Since then progress has been rapid, though we are still a long way from a real test-tube baby of the type envisaged by Aldous Huxley in *Brave New World.* To grow a baby in an artificial womb, or even in a human placenta somehow nourished in culture, is still many years hence, though when the time comes many women will probably be pleased to be relieved of some of the burden of pregnancy as well as the menstrual cycle. For the moment the only practicable way to develop a test-tube egg to full term is first to grow it in the laboratory for three or four days and then transplant it to the human womb. This in itself will allow many infertile women to conceive. A common cause of infertility is one in which the eggs fail to travel from ovary to uterus because of a blockage in the Fallopian tubes. With the technique developed by Dr Step-

toe, who uses volunteer infertile women patients, it should soon prove possible to remedy this condition.

The wife is stimulated with hormones to produce several ova in her menstrual cycle. By minor surgery under a general anaesthetic one or more ova are withdrawn through the wall of the abdomen, a process which can be done repeatedly. The eggs are fertilized by the husband's sperm. The first cell division takes place within thirty-six hours of insemination, and within four days or so the embryo has grown in the laboratory to around fifty cells. The last step is to replace the embryo in the wife so it can grow to full term and be delivered naturally. In a sensational television appearance at the beginning of 1970 the impression was given by one Lancashire woman that an attempt would shortly be made to transplant the fertilized egg into her womb; that did not happen, but the successful development of the first laboratory fertilized mature human foetus cannot be long delayed, thus bringing relief to women with a Fallopian blockage. 'The desire to have children must be among the most basic of human instincts,' comments Edwards, 'and denying it can lead to considerable psychological and social difficulties.' Already because of increased abortion there is evidence of a 'baby famine' for those who wish to adopt a child. So Edwards reckons: 'There would probably be demand for thousands of babies by this means every year—babies that are not born now.'[1]

Dr Edwards sees this research paying off in many other ways. By being able to study the development of the embryo under controlled laboratory conditions there is an 'excellent' chance of developing new techniques of contraception, in particular the birth-pill which can be taken the morning after. A further likely benefit is a new understanding of genetic disorders such as the cause of mongol births. Being able to choose between boy or girl is another possibility. This could have great eugenic applications since many genetic disorders are sex-linked, occurring usually in the male. In couples with a history of genetic disorder only the female

1. Robert Edwards and David Sharpe, *Nature*. 14th May 1971.

blastocyst would be replaced in the womb. Not least there is the pure knowledge of knowing what we are and where we come from.

At first it was difficult to get the male sperm to penetrate the tough outer membrane of the egg. The sperm is very small and fragile-looking in relation to the egg, about the size of a pin in relation to a football. Then one of the Cambridge team, Barry Bavister, bathed the egg in the same nutrient as had been used when trying to fertilize hamster eggs. This led to the breakthrough of 1968. The technique has been progressively improved since those early days. By using hormone treatment, including the fertility drug gonadotrophin, before the eggs are removed, it is possible to ensure that many of the eggs are ripened and ready for fertilization. The ideal is to take the supply of eggs just before the point of ovulation, which Edwards and Steptoe are now able to gauge very precisely. (Again this has enormous implications in everyday life for couples wishing to use either the 'safe' period or the most fertile one.) The egg, or possibly several eggs, are then fertilized with a droplet of sperm.

Since Edwards and Steptoe made their first announcement their work has been copied all over the world. The likely ramifications of all this research are immense. Some childless women suffer not from a blockage of the Fallopian tubes but from an inability to produce fertile eggs at all. For them there could be the possibility of pre-natal adoption—that is, the fertilized egg from one woman is supplied to another who acts as the incubator. To make sure of a stock of good-quality eggs hospitals could set up 'egg banks' where eggs could be kept in deep-freeze conditions. A female donor of approved stock could thus be a bloodmother of hundreds of children in her lifetime or even when dead. Not all that fantastic when you think about it, for children have already been born from sperm kept deep-frozen for two or more years. In the animal world prize bulls long since dead still continue to sire magnificent progeny.

A crucial part of everyone's work in this field is to ensure that the first implants contain no abnormalities. Nobel Prize

Winner Dr James Watson, the molecular biologist, speaking at an international symposium in Washington, warned: 'There are going to be a lot of mistakes. What are we going to do with the mistakes?'[2] Others are more confident, claiming that there are many and fast-improving techniques for monitoring the foetus and that this will be done at constant intervals. Tests on samples of the fluid surrounding the foetus can be made. Should signs of abnormality appear the mother would have the option of having the pregnancy terminated.

Almost every researcher in the field is conscious of the need to establish ethical guidelines. There is the somewhat sinister possibility that the work could lead to genetic engineering far beyond sexing or the removal of genetic defects. Donor cells could be injected during foetal growth (as has already been done with mouse embryos) to create a kind of composite personality. More distant (and more agreeable) is the world of the clone—someone who is the living replica of someone else without being an identical twin. Experiments with animals have shown that the chromosomes or nucleus can be removed from the ovum and replaced with the chromosomes of a donor. The embryo would then grow up with all the characteristics of the donor rather than its own. Several hundred eggs could be 'cloned' like this, a good thing perhaps if one did it with an Einstein. But say you cloned another Hitler! However, wisely used the work that began in Dr Edward's tiny laboratory could be a source of immense happiness to childless couples all over the world. This could be 'Brave New World'—but not in the ironic sense that Huxley used it.

2 *Daily Telegraph*, 18th October 1971.

Chapter 34

SCIENCE: THE NURSERY OF GENIUS

Judged by the crude test of the number of Nobel Prizes gained since the awards started in 1901, British scientists are second only to the Americans in their contribution to world science. Up to the end of 1973 America had ninety prize winners in the three categories of Physics, Chemistry and Medicine. The British with a quarter of the population had fifty-six and the Germans forty-seven. No other countries could approach these figures.

The British contribution has always been particularly marked in the up-and-coming fields of science. Science has its fads and fashions; its various branches do not progress at a uniform rate. Periodically, after years of 'more of the same', there is a rejuvenating process in one sector, perhaps because of an important breakthrough. During the early part of the century it occurred in nuclear physics. Now it is happening in geology, molecular biology and radio-astronomy. In each field it is the British who first led the way, and if one had to single out one place for special merit it would be the Cavendish Laboratory, sometimes called 'the nursery of genius'. Sixteen Nobel Prize winners have been products of the nursery and several more have worked there. Here it was that the Cavendish's first professor of experimental physics, James Clerk Maxwell, advanced the theory of electromagnetic waves that led to the development of radio. Here it was that Joseph John Thomson, the famous 'J.J.', a Manchester-born mathematician, first discovered the electron in 1897, thus revealing the startling truth that the atom was not an irreducible ball of matter but an infinitely complex structure. It was the start of the twentieth-century nuclear revolution. Here too in 1918 Ernest Rutherford, farmer's son from New Zealand, first split the atom.

To anyone with a sense of reverence for scientific achievement a walk round the ancient and modern collection of buildings that make up the Cavendish can be a bit like a religious experience. 'This is where it all began,' you say to yourself, 'the place which turned the twentieth century upside-down.' And turned it upside-down not just in the realm of nuclear physics and atomic power but in molecular biology, with the discovery of the DNA genetic code of life that some fear (or hope) may enable man to play God and engineer new human life to order. In geology recent discoveries have enabled us to re-write with certainty the history of the earth. Now radio-astronomy is enabling us to re-write the history (and possibly the future) of the universe, as well as some of the fundamental laws of physics. But for all the ferment of ideas and achievements that have flowed from the Cavendish, it remains a curiously British institution—full of the genius of improvisation and 'making-do'.

The buildings are a jumble of styles and there is nothing lavish about them, not even the 'new' one put up with a £250,000 donation from motor magnate Herbert Austin just before the Second World War. The original Cavendish block in Victorian stone was the gift in 1873 of the university chancellor, the Duke of Devonshire, whose family name is Cavendish; one of his forebears was the famous eighteenth-century scientist Henry Cavendish. The laboratory cost £8,450, which was £2,000 in excess of budget, although a modest enough sum even at Victorian prices. Its great head, J. J. Thomson, who took over in 1885, was forced to be stingy—the cost of research facilities for forty students was a mere £500 a year, or little more than a student's annual grant today. None the less he made an excessive virtue of economy, as did his successor Rutherford.

Sir Lawrence Bragg recalls that as a twenty-one year old research student when he was working on the X-ray study of the structure of crystals, he had the misfortune to break a piece of equipment worth 10*s*. Work was held up because the parsimonious laboratory refused for several weeks to buy a replacement part. Four years later this same work won

Bragg and his father Sir William the Nobel Prize for physics. Science-writer Lord Ritchie-Calder remembers that on another occasion in the twenties a visiting American and he were being escorted round the Cavendish by Rutherford when they spotted a shadowy figure solemnly turning the pedal of an upturned bicycle which was driving some sort of dynamo. As they passed the shadowy figure inquired: 'By the way Prof, when do I get that motor?' Rutherford assured him: 'Any day now. I think I can raise the money.' The shadowy figure turned out to be Francis Aston, already a Nobel Prize winner.[1]

The revolution launched upon the world by the Cavendish will be better understood if we look briefly at the nature of the atom. In size it is so small that a million atoms edge to edge would not equal the thickness of this page. Rutherford put it just as graphically when he said that if the entire population of the world spent the whole day doing nothing else it would take them fifty years to count a thimbleful of atoms. But small as it is the atom, as we have seen, is not a solid ball. It is in fact mostly space. The minuscule heart of the atom is the nucleus, so small that it is less than 1/100,000th of the diameter of the atom. The nucleus is composed of protons (positively charged) and neutrons which are two of the atom's three basic kinds of building-bricks. The third kind of building-brick is the electron (negatively charged) which circles the nucleus at very high speed and is held captive to the nucleus by its attracting electrical force. The structure of an atom has been likened to a miniature solar system with the electrons as the planets and the nucleus as the sun. The electrons, however, are even more minute in relation to the nucleus than are any of the planets to the sun. To quote another Rutherford analogy: 'If an atom were enlarged to the size of St Paul's Cathedral, the electrons would be the size of a pin's head.' Whether the substance is lead or gold or oxygen its atoms have the same kind of protons, neutrons and electrons and the same basic internal structure. Where the atoms of the ninety-two natural elements differ is in the

1. Ritchie Calder, *Profile of Science*. Allen & Unwin, 1951; page 49.

number of neutrons, protons and electrons that each has. Yet none of this was known until Thomson's discovery of the electron.

For the next forty years the majority of the significant steps in building up our portrait of the atom were taken at the Cavendish. Rutherford's protégés came from all over the world—like, for instance, the distinguished Dane Niels Bohr whose model of the atom won him the Nobel Prize for physics in 1922.

Francis William Aston (Nobel Prize for chemistry, 1922), who had once been a research chemist with a brewery, was the first man to separate isotopes artificially. The actual discoverer of the isotope was an Oxford man, Frederick Soddy (Nobel Prize for chemistry, 1921), who worked with Rutherford. He found that certain elements come in two or more varieties with similar chemical and physical properties but differing atomic weghts. The varations he called isotopes. Investigating the cause of radiation from uranium, Soddy found that uranium, atomic weight 238, also had a lighter variety of atomic weight 235, which was much more unstable than uranium 238 and gave off rays. Uranium 235 has to be separated from uranium 238 to make nuclear fuel for weapons. Such was the uranium isotope that was to lead to the A-bomb. Aston's great achievement was to invent a device called the mass spectrograph which by an ingenious use of magnetic deflection enabled the lighter variety of element to be separated from its heavier brother. By analysing over fifty of the ninety-two natural elements he showed that not just the radioactive elements had isotopes, but nearly all of them had. His work was fundamental to the understanding of atomic structure.

The Cavendish produced many other landmarks in atomic research. A Scot called Charles Wilson, usually known by his initials C.T.R., was a maker of artificial clouds. He got the idea while admiring cloud formations on top of Ben Nevis, which in those days had an observatory. The cloud chamber which he invented in 1911 made possible the close observation of atomic particles. It has been a fundamental

instrument of atomic research. The cloud chamber, not much bigger than a jam jar, is filled with moist air. When Wilson cooled the air by suddenly reducing the pressure, tiny clouds were formed. By shooting X-rays through the chamber he was able to ionize the air or break it up into electrically charged particles. (Ions are electrically charged atoms or groups of atoms. When an atom is not electrically charged its protons (+) counteract the electrons (−). But if an atom becomes ionized by, for instance, X-rays, this means that electrons have been detached from their atoms; so the balance between protons and electrons has been upset, and the atom has become charged.) Droplets of water condensed round the particles, which made their tracks readily visible. Through the glass cover of the cloud chamber (blown by himself—the most illustrious scientists at the Cavendish usually made their own equipment) Wilson could observe the hitherto invisible tracks of ionized atoms and other particles trailing behind them a fine spray like the condensation from high-flying aircraft. From time to time the particles collided and the tracks would explode into a fresh pattern of trails. Using an improved cloud chamber Patrick Blackett (Nobel Prize for physics, 1948) was actually able to photograph Rutherford's nucleus-smashing experiment, although it took 23,000 photographs to produce eight nuclei in the act of being shattered.

Later, using an automatic cloud chamber, Blackett was to make himself a leading authority on cosmic rays, those immensely energetic particles which speed to earth at tremendous velocity from outer space. As you read this page a cosmic particle will probably pass right through you. They are especially numerous during periods of solar flares. By photographing cosmic ray particles Blackett and his Italian colleague Occhialini proved the existence in these particles of positive as well as negative electrons. The electrons are born in pairs when a cosmic particle collides with an atomic nucleus. This is the transmutation of light into matter. But the positive electron, or positron, has a brief life, for when it encounters a negative electron the embrace is suicidal; the

one destroys the other with an immense release of energy in relation to their size. This represents the opposite process: transmutation of matter into light.

The discovery of the positron accorded very well with the theory of the brilliant Cambridge theoretical physicist and mathematician Paul Dirac (Nobel Prize for physics, 1943) that for every positive charge in the universe there is a negative charge—or, to put it another way, for every particle there is an anti-particle.

Indeed the thirties was a period of explosive advance in nuclear physics as secret after secret was prised from the heart of the atom. Rutherford called it 'the heroic age of physics'. Novelist Lord (C. P.) Snow, who was a young scientist at the time, summarizes the scene vividly:

> There had never been such a time. The year 1932 was the most spectacular year in the history of science. Living in Cambridge one could not help picking up the human, as well as the intellectual, excitement in the air. James Chadwick, grey-faced after a fortnight of work with three hours' sleep a night, telling the Kapitsa Club (to which any young man was proud to belong) how he had discovered the neutron; P. M. S Blackett, the most handsome of men, not quite so authoritative as usual, because it seemed too good to be true, showing plates which demonstrated the existence of the positive electron; John Cockcroft, normally about as much given to emotional display as the Duke of Wellington, skimming down King's Parade and saying to anyone whose face he recognized: 'We've split the atom! We've split the atom!'[2]

(Whereas Rutherford had split the atom by natural means using radioactive substances to bombard nuclei, Cockcroft had split the atom artificially by using an atom-smasher.)

The cloud chamber had again been used when Sir James Chadwick (Nobel Prize for physics, 1935) discovered the neutron Its existence had long been supposed by Rutherford and others in order to explain the existence of isotopes; for

2. C. P. Snow, *Variety of Men.* Macmillan, 1967, page 1.

how else could there be atoms of the same element, with the same proton/electron configuration, yet differing in atomic weight? Because the unknown constituent was presumed to have no electric charge it was called the neutron. By filling a cloud chamber with nitrogen and exposing it to beryllium rays, Chadwick studied the impact of the rays on the nitrogen nuclei, which seemed to be recoiling from a series of invisible blows. But from what? Obviously from the mysterious neutron which, having no electrical charge, attracted no vapour trail in the cloud chamber. Rutherford likened the neutron to H. G. Wells's Invisible Man playing football. You couldn't see him, but you could certainly follow his path as he tackled and knocked over the opposition. By measuring the recoil of the nitrogen nuclei Chadwick was able to write of 'particles of mass nearly equal to that of a proton and with no net charge'. At last the neutron had been found—after a persistent and inspired search. Now the mystery could be more clearly answered about atoms and their isotopes. For instance, uranium had an atomic weight of 238 composed of 92 protons and 146 neutrons, whereas uranium 235, with three fewer neutrons in its nucleus, is much more unstable and can be used for nuclear fission.

Because the neutron has no charge it is not repelled by the nuclei of atoms and can penetrate much more deeply into the heart of matter than can be achieved by bombarding nuclei with alpha particles (which are helium nuclei derived from a small quantity of radium) and protons. Instead of chipping at the atom it was soon to prove possible to split it down the middle, with destruction of matter and enormous release of energy. And that was to lead to a self-generating chain reaction—either controlled in an atomic pile or uncontrolled in an atomic explosion. So in a very real sense Chadwick was father of the modern nuclear physics which led to the bomb and the nuclear reactor.

The most expensive piece of equipment ever installed at the Cavendish before the war cost £500. It was the particle accelerator or atom-smashing machine designed by two of Rutherford's 'boys'. They were a young Yorkshireman, John

Douglas Cockcroft, who had started as an electrical engineer in a Manchester factory before switching to mathematics at Cambridge, and a twenty-seven year old Dubliner, Ernest Walton The Cockcroft-Walton accelerator, using high-voltage, high-vacuum techniques, produced a fusillade of proton 'bullets', which artificially split and transmuted atoms of lithium and boron. They performed the first experiment one morning in April 1932. In his book *Profile of Science*[3] Lord Ritchie-Calder recalls the scene: 'Rutherford hoisted his six-foot frame onto the laboratory bench, hat tipped to the back of his head, like the New Zealand sheep farmer he might have been. "Take over, Cockcroft," he said. "It's your show."'

In the darkened hall, switches were thrown. The machine hummed into life 'Lightning crackled and flashed as the high-tension spheres sparked. A tall glass pillar glowed with a luminous blue haze. Presently there was a clicking sound, and a counter like a mileage recorder in a motor-car began to clock in the fragments of the splitting atoms.' It was still a very primitive machine compared with present-day accelerators and used energy only one-millionth of that proposed for the European 300-GeV accelerator. But it worked and it was first. True to the Cavendish tradition of improvisation, biscuit tins, sugar crates and even plasticine had been used. It was an historic moment fraught with meaning for the future, although Rutherford for one remained curiously blind to all the consequences. He reckoned that it would take more energy to split the atom than could ever be got out of it. He did not think of atomic energy as a source of power, still less would he discuss it as a weapon of war. In this respect Cockcroft was far more prescient. Yet Rutherford must have had his awed and uneasy doubts, for at the end of an experiment someone asked him: 'Where do we go from here?' Rutherford replied: 'Who knows? We are entering no man's land.' And so they were.

For, of course, when an atom was smashed and flew off in pieces it did so with such energy that this could only have

3. *Profile of Science*, page 19.

come from the actual destruction of a small part of the nucleus itself.

In 1905 Einstein had predicted in his famous equation $E = mc^2$ what would happen if matter was converted into energy. E equals the energy when a mass m is completely destroyed and c is the speed of light, which is 186,000 miles per second. Squaring c resulted in a fantastic figure of energy and gave some hint of what could be achieved by a self-generating process of nuclear fission. Eventually the world's first atom bomb was made in America, but the basic idea stemmed from the laboratories of Europe, of which the Cavendish was the pioneer.

In 1938 Rutherford's former student and lifelong friend, the German Otto Hahn, found the clue to uranium fission, when he discovered that bombardment of certain uranium atoms with neutrons could split the atoms into two approximately equal halves. When Hahn made his announcement in January 1939 it caused a furore in scientific circles; it seemed unimaginable, like splitting a brick with a peashooter. At first Hahn had not understood the significance of his experiments. But within a month the implications had been worked out in Copenhagen by two physicists from Germany—Lise Meitner, a former colleague of Hahn, and her nephew Otto Frisch. There was confirmatory work in France by the Joliot-Curies; at the Cavendish, inevitably; and at Columbia University, where the brilliant physicist Enrico Fermi was a fugitive from the Musolini régime. Fermi advanced the likelihood of a chain reaction; for when a uranium atom was split it left, typically, two lighter nuclei such as barium and three free neutrons. These can bombard other uranium atoms and split them, and so on, with enormous release of energy. No longer would the atom be a 'sink' or drain of energy as Rutherford had mistakenly supposed. Now it would be a major source of energy.

In the scramble for the secrets of nuclear fission that followed Hahn's announcement, the Hitler régime showed its customary obtuseness and anti-intellectualism in scientific matters. Hitler even referred to nuclear physics as 'Jewish

physics'.[4] He drove key workers like Meitner and Frisch out of the country or otherwise alienated them. The British, however, were fully alive to the potential of fission. In April 1940 a committee under Sir George Thomson, J.J.'s son, was appointed, with Chadwick as a key member, to look at the possibilities of an atomic explosion. In July 1941 the committee reported that a bomb of unrivalled destructive power was possible. Another member of the committee, Sir Rudolf Peierls, had worked out the right size and method, but a blitz-torn Britain, where bombs had already damaged the research laboratory, was no place for expensive and complicated research and development. In 1943 the entire British research and know-how, which had cost up to £160 million, was exported to the United States with a team of British scientists under Chadwick's leadership. They supplemented the already substantial American effort. In December 1942 Fermi had had the world's first atomic pile operating in Chicago. In less than three years the unique American genius for turning research into industrial application was to produce the greatest and most awesome event in mankind's history since the discovery of fire.

Rutherford and his 'Cavendish Boys' spread their imprint over the whole spectrum of science, pure and applied. The key British invention of radar by Sir Robert Watson-Watt (see Chapter 35), and still more its development, owed much to the Cavendish. Sir Edward Appleton (Nobel Prize for physics, 1947), son of a Yorkshire millworker, was a Cambridge man who later went to London In 1924 he demonstrated the existence of the Heaviside Layer, a kind of 'ceiling' of electrically charged particles sixty miles up, by bouncing radio waves off it. Two years later he discovered a much stronger 'ceiling' at a height of 150 miles, which came to be called the Appleton Layer. This was a crucial discovery in long-distance radio communications, since the layer acts as the 'mirror' off which short-wave radio signals

4. Albert Speer, *Inside the Third Reich*. Weidenfeld & Nicolson, 1970; page 228.

are reflected. It was also an early demonstration of the basic 'echo' technique of radar.

To Patrick Blackett goes the credit for first suggesting to Watson-Watt that high-frequency direction-finding should be tried on shore and in ships 'to locate the individual and talkative U-boats,' a debt generously acknowledged by Sir Robert in his autobiography *Three Steps to Victory.*[5] As a young midshipman in the First World War Blackett had fought at Jutland; because of his promise the Admiralty sent him to Cambridge when the war was over. He was not just a brilliant scientist but a man who knew how to talk to generals and admirals—profitable qualities for his country when the next war came. It has been said of the Cavendish that it ran the war technically as well as scientifically. One of the essential link men in the development of radar was John Cockcroft. Shortly before the Munich crisis he had lunch at the Athenaeum with Sir Henry Tizard, who headed the Committee on Air Defence, and he heard with excitement details of a highly secret device called 'radio detection and ranging'. It was still very much in the teething stage and it occurred to both Cockcroft and Tizard that a supply of skilled men from the Cavendish could make a valuable contribution. After Cockcroft had visited Watson-Watt's secret research station in Suffolk he prepared a list of young Cavendish scientists who could help, among them Martin Ryle. When war came they not only worked on research, but in some cases operated the early radar stations as well. Soon the Cavendish Boys were joined by others, including Bernard Lovell, later to make an international name for himself with his Jodrell Bank radio telescope. Watson-Watt was to call the eighty or so scientists acquired for radio research 'this galaxy of first-magnitude stars'.[6]

In the realm of pure science a further new particle was suggested in 1935 by the Japanese physicist Yukawa in order to account for the immensely strong force holding protons and neutrons together. He suggested that this ele-

5. Odhams Press, 1958; page 359.
6. *op. cit.*, page 213.

mentary particle oscillated rapidly to and fro between neutron and proton, attracting both of them to it. In 1936 the famous American physicist Carl Anderson, who had been working on cosmic rays, announced that he had discovered just such a particle, with a mass 200 times that of an electron, which he called the mesotron – or meson for short. After the war Professor Cecil Frank Powell of Bristol University (Nobel Prize for physics, 1950) used high-altitude balloons equipped with photographic plates to study cosmic rays and found not one meson but two. These became known as the mu-meson (muon) and pi-meson, or pion. Now more and more short-lived particles are being discovered in the atom; not just neutrons but neutrinos, not just two mesons but several; not only particles which have lives of a ten-thousand millionth of a second but mysterious, pseudo-particles known as resonances whose transient, ghost-like existence lasts for only ten billion-billionths of a second. The smaller and more short-lived the particle, the bigger and more expensive the equipment required to analyse it. The multimillion dollar atom-smashing synchrotons like the one at Brookhaven, Long Island, USA, are a far cry from Cockcroft's primitive £500 appliance. Such is progress in the space of little more than three decades.

Rutherford died before the war. He was only sixty-six and in full vigour; but for the accident of a strangulated hernia he could have continued into old age. In October 1937 he was laid to rest by the side of Isaac Newton in Westminster Abbey. An extraordinary success story . . . from New Zealand log cabin, the son of an odd-job farmer, to House of Lords and a permanent place in the halls of the great. He was vain and surprisingly thin-skinned, but a man of boundless vision and energy. He was no believer in God, but in times of stress he could be heard humming the hymns of his youth such as 'Fight the Good Fight'. At the crest of the wave, which was his usual mood ('After all I *made* the wave, didn't I?'), Rutherford would stride triumphantly through the laboratory whistling 'Onward, Christian Soldiers'.

Like many great innovators Rutherford was of Scottish

stock; his father had emigrated from Perth to New Zealand at the age of three. The family had been very poor, but had the typical Victorian belief in self-betterment. He had a good grounding. It is the Scottish belief in education allied to a traditionally pioneering spirit which has contributed so much to the world. 'He revelled in creation and success and everything that happened to him. . . . It was to this man we owe the entire atomic age. And the Cavendish was the greatest physics laboratory in the world,' Lord Snow has commented. Perhaps that assessment requires some qualification. It was, after all, J. J. Thomson, that oddly shuffling figure with hands clasped behind his back, the legendary absent-minded 'Prof', whose discovery of the electron started the fundamental quest into the nature of matter. 'It's said of Thomson that he opened the doors of the new physics but never went through himself. Perhaps that's so,' said Sir Lawrence Bragg. 'But the doors he opened let through the most glorious swashbuckling adventurers who absolutely smashed all the calm of the old classical physics.' For forty glorious years, the Golden Age of the Cavendish, the smashing went on.

Of course it is possible to take a mixed view of Rutherford, who himself never earned more than £1,600 a year as a professor. In some ways his 'string and sealing wax' approach, inherited rather too readily from 'J.J.', was pernicious. One man who worked with him, the geophysicist Sir Edward Bullard, declares: 'I would be prepared to argue that Rutherford was a disaster. He started the "something for nothing" tradition which I was brought up in and had some difficulty in freeing myself from—the notion that research can always be done on the cheap, the notion that things don't cost what they do cost. It is wrong. The war taught us differently. If you want quick and effective results you must put the money in.' Maybe. But the other extreme of too much injection of public funds, which carries the penalty of massive bureaucratic interference, can be equally stultifying. It is instructive to compare the British and American experience of radio-astronomy when it was a young and fast-growing science in the period after the war. Sir Martin Ryle

made sweeping advances with a £50,000 radio telescope while the Americans experimented unsuccessfully with a giant dish of 600 feet diameter which cost several hundred times as much and was never in fact completed. Ryle, aware that he had not got millions to spend on a vast dish, was forced to think of some much cheaper technique that would achieve basically the same result. And he did, as Chapter 36 will show.

If this is the product of 'string and sealing wax' thinking, then let it not be sneered at. The Cavendish tradition has proved that an ounce of inspiration can be worth a million pounds of equipment.

Rutherford's successor at the Cavendish in 1938 was Sir Lawrence Bragg, crystallographer extraordinary who, with his father Sir William, had seventeen years previously used X-rays to reveal the molecular architecture of solids. The two Braggs won the Nobel Chemistry Prize for their work in 1915; Lawrence Bragg was only twenty-five—the youngest-ever winner. The news reached him when he was serving in the trenches on the Western Front - there was no time to celebrate, still less to attend any award-giving ceremony. What the Braggs had done by their painstaking work was to found a whole new science of X-ray crystallography. When X-rays encounter any regular structure of atoms, which are the building-bricks of the crystals inside solids, these rays are diffracted into a pattern, much as a beam of light is by a glass prism (though this process is known as refraction rather than diffraction). The Braggs worked out a mathematical formula for interpreting the pattern, now well known as Braggs' law. From this it became possible to deduce with accuracy the arrangement of atoms in a solid and the distances between them as well as the distances between layers of atoms. Every solid has a rigid latticework of atoms with every atom anchored to its place and unable to move except to vibrate a little. What anchors one atom to its neighbour is the electrical attraction between the positive charge of one atom and the negatively charged electrons of the other. There are four main types of bonding and each

gives a solid its peculiar characteristics -solubility, conductivity, melting and freezing qualities, malleability, stress and fatigue characteristics and so on.

X-ray analysis has given birth to the whole new branch of science known as solid state physics, so-called because it is concerned with the behaviour of matter in its solid rather than liquid or gas states. X-ray analysis has taken much of the hit and miss out of predicting a metal's performance, and enabled man to construct alloys and synthetics with immeasurably greater strength and versatility. At Cambridge as early as the 1930s John Desmond Bernal, who had worked under Bragg, was applying crystallography to biological systems. This was a first step that led to the great breakthrough in molecular biology of the 1950s. Meanwhile work on solid state physics which began twenty years ago as pure research has had a technological spin-off leading to today's transistor radios and pocket tape-recorders. The Cavendish achieved a world reputation for its work in metal physics under the leadership of Bragg's successor Sir Nevill Mott. Another exciting branch of metal physics is superconductivity. This occurs when certain metals are cooled to within a few degrees of absolute zero, when electricity can pass through with nil resistance. In other words a current induced will continue indefinitely. This phenomenon was discovered in 1911, but much of the experimental verification of the theory derived from the brilliant work at Cambridge in the sixties of the youthful Brian Josephson, already a winner of the United States Research Corporation Award, who must be a strong tip for a Nobel Prize. Superconductivity has immense applications in micro-circuitry and also long-distance transmissions of electricity. 'We are still ahead in many of these fields and the Americans are prepared to admit it,' Sir Lawrence Bragg commented a year or so before his death in 1971.

He was a benign white-haired man whose considerable activities when he celebrated his eightieth birthday in 1970 included two or three full days' gardening a week, making his own marmalade, pickling his own walnuts and editing a

multivolume library of science for the Royal Institution. The Braggs were talented in various ways. The father invented ASDIC submarine detection in the First World War. The son developed a sound-ranging system for locating enemy guns, a system used with success against Rommel in the Desert War.

Besides his own talents as a scientist Sir Lawrence was a remarkable head of the Cavendish. Like Rutherford, who knew how to bring on young men and encourage the spark of originality, Bragg showed a special genius for knowing which new branches of science to encourage; scientifically speaking he could pick the winners. It was under his aegis at the Cavendish that the great breakthrough was made in molecular biology by Crick and Watson, with Maurice Wilkins of London University supplying the X-ray diffraction pictures of DNA and RNA, the molecules that control the heredity of mankind and of all life. All three shared the Nobel Medicine Prize in 1962. Again it was Bragg who played scientific father at the Cavendish to Dr Max Perutz, an Austrian refugee from Hitler, in 1938. His X-ray diffraction work on the structure of the globular protein of haemoglobin, the oxygen-carrying component of red corpuscles, was briskly encouraged by Bragg. After the war a former radar scientist, John Kendrew, joined Perutz's research group to work on the X-ray analysis of myoglobin (the protein that stores oxygen in the muscles). In 1962 they became joint winners of the Nobel Prize for chemistry.

Probably it was just as well for the Cavendish that the laboratory did not have another nuclear physicist as its head after Rutherford. He might have flogged an old tradition too hard, at a time when atomic research was becoming vastly expensive. As it was, when the war came to an end and the young Martin Ryle returned from his radar research thinking to take up nuclear physics, Sir Lawrence advised him to try radio-astronomy.

Chapter 35

'SIR ECHO'

'The interplay of operational and technical experience was our real secret weapon. In its use we far outran the enemy.' *Sir Robert Watson-Watt.*

When we salute the achievements of the Few in the Battle of Britain it should not be forgotten that their victory was only made possible by the superior achievements of British technology in the field of radar. Adolf Galland, most famous of the Luftwaffe pilots, was to comment:

> The British had from the first an extraordinary advantage, never to be balanced out at any time in the whole war, in their radar and fighter-control network. The British fighter was guided from take-off right to the appropriate position for attack on the German formations. We had nothing like it. . . . The successes were noteworthy. We were dependent in combat on our own eyes. The British fighters could entrust themselves to the dependable and many times more far-seeing radar-eye.[1]

The battle which saved Britain could not have been won without the magic eye of radar, and if one man could claim to be the father of radar more than any other it was undeniably Sir Robert Watson-Watt, a short, plump, Pickwickian-looking Scot, son of a carpenter, from the proud little city of Brechin in the foothills of the Grampians—a witty man and a voluble one. On his own estimate he was 'a sixth-rate mathematician' (highly doubtful), but as an electrical engineer he had a quicksilver mind with an essentially practical twist. Like most technological innovations of significance radar did not happen overnight. Its antecedents

1. Quoted by Sir Robert Watson-Watt in *Three Steps to Victory*. Odhams Press, 1958; page 249.

were long—in a sense as old as Clerk Maxwell's discovery of electromagnetic waves in 1873 or the German Heinrich Hertz's discovery of radio waves in 1887. For of course radar is basically radio with an echo—the reflection of radio waves by certain objects and the art of deducing from these echoes the distance, direction and the nature of the object.

Watson-Watt's own work in the field began in the First World War with the radio detection of thunderstorms from an inauspicious looking wooden hut at Aldershot camp. From there in the twenties he moved to another rather more glorified set of wooden huts looking not unlike a chicken farm at Datchet near Slough, where under the auspices of the Department of Scientific and Industrial Research he began research into the problems of radio-physics and atmospherics.

As we saw in the previous chapter Appleton, a product of Rutherford's 'nursery' at the Cavendish, had first demonstrated the existence of layers of charged particles in the earth's upper atmosphere by bouncing radio waves off them and measuring their return. By recording these echoes on a cathode-ray oscilloscope, not unlike the tube of a television set, Appleton was using the basic technique of radar.

In the journal *Nature* after the Second World War Watson-Watt commented: 'It is morally certain that without the peaceful pursuits of Appleton and his colleagues in ionospheric research, radiolocation would have come too late to have any decisive influence in the war.' In somewhat less generous mood in his autobiography *Three Steps to Victory* Sir Robert states that if Appleton's ideas had been followed radar would never have been ready. Re-quoting the Duke of Wellington's comment after Waterloo, Sir Robert unblushingly declared: 'By God, I do not think it could have been done if I had not been there.' [2]

What can for certainty be said is that Sir Robert Watson-Watt was the man more than any other who grasped a principle known to many and developed it to the point where it became an effective instrument of detection. His experi-

2. ibid., page 125.

ments with the cathode-ray tube—the 'Magic Bottle' as he called it enabled him to develop an early electronic direction-finder, and by having two stations four hundred miles apart, one at Datchet and one at Leuchars, the RAF station in Fifeshire, he was able to plot the range, speed and direction of thunderstorms. Around the same period, in 1932, British Post Office engineers happened to notice that their transmissions were interfered with by landing aircraft, indeed signals were reflected back.

By 1934 the Air Ministry was searching for a way to improve aerial defences. It was clear that, with an 'early warning' system that depended only on the eyes and ears of the Observer Corps, hostile bombers could swamp Britain. Dr Harry Egerton Wimperis, Director of Scientific Research at the Air Ministry, and his colleague A. P. Rowe combed through dozens of files and considered all sorts of possibilities, including a death ray for shooting down aircraft. Asked for his comments on the death ray Watson-Watt at once gave his firm view that the amount of energy required made it an impossibility. But rather than destroy an enemy aircraft it might be possible to detect one. . . . From this sprang the whole empire of technology known as radar. 27th February 1935 was a vital date in the story of radar. On that day Sir Robert had sent a report to a special Air Ministry committee headed by that redoubtable scientist statesman Sir Henry Tizard, and composed of Wimperis and professors Blackett and A. G. Hill. The previous day Watson-Watt had staged a demonstration at Daventry. While an old Heyford bomber flew up and down, the pilot unaware of the historic nature of his flight, Sir Robert in a caravan below with his precious 'Magic Bottle' showed how the bomber's arrival and departure were signalled on the luminous cathode-ray tube, in effect a sort of television set, by a little vertical stub of light which grew and then diminished as the bomber faded away.

The Tizard committee gave Watson-Watt the immediate go-ahead. By 9th September an aircraft was followed for fifty-eight miles, and by the end of that month it was decided

that a chain of radio-detection stations should be built from Southampton to the Tyne. By this time Watson-Watt and his team had been moved away to Orford Ness, a remote spot in Suffolk, part of a long, narrow peninsula, a near-island and by custom known as the Islands. The early radar pioneers acquired the romantic title of 'The Islanders'.

The official history of the RAF records: 'With the advent of Watson-Watt there occurred, in an incredibly brief period, nothing less than a revolution in the science of air defence. The sequence of events in early 1935 would be accounted rapid anywhere. For work in which Government circles were involved it was almost miraculous.' According to Watson-Watt the team's motto was: 'Give them the third-best. The second-best comes too late. The first-best never comes at all.' If ever the project appeared in danger of stultifying 'when the mills of the Air Ministry were grinding exceedingly slow in 1936', Sir Robert applied his Scottish stubbornness and pugnacity. Mysterious aerial masts began to sprout round the coast; the first moves were also made towards radar equipment compact enough to fit into aircraft. In 1937 Sir Robert and his wife Margaret—popularly known as Meg Watt—made a joint espionage trip to East Prussia, following intelligence reports that the Germans were also on to the secret of radiolocation. Since Sir Robert was now on the Air Ministry staff it was a decidedly dangerous mission, but the two played the part of rubber-necking tourists, Margaret with her sketch-pad always at the ready. However, no outcrop of radio masts was detected; indeed the British radar system, as Galland was to point out ruefully, took the Germans by surprise when the war came.

Just four weeks before war was declared, when the chain stretched round the east and south-east coasts, the first successful exercise took place of IFF (Identification, Friend or Foe). The alertness of the system was demonstrated by the wail of an air-raid siren at the end of Neville Chamberlain's declaration of war broadcast on 3rd September 1939. Radar had spotted an unidentified aircraft. It turned out to be a French plane carrying an assistant military attaché back to

France. He had omitted to inform the authorities of his trip.

Work on radar inside aircraft proceeded apace, and the first successful AI (Aircraft Interception) units were working by the summer of 1940. Day fighters needed only to be guided into the general vicinity of enemy aircraft and could then engage visually, but when the Luftwaffe switched from costly daylight raids to night bombing, AI was to prove invaluable for night fighters. Radar, of course, was crucial in the winning of the Battle of Britain. It was the only way in which German aircraft could be intercepted fast enough without maintaining standing patrols—and there simply were not enough RAF fighters to maintain such patrols.

In 1957 Sir Robert told the Royal Commission on Awards to Inventors, in a convincing feat of advocacy that gained him £52,000 from the Government: 'At one point in the Battle of Britain there was, even with radar, within the metropolitan section, a time when there was not one single fighter on the ground refuelled and ready for action. Had the enemy added one more raid to their day's efforts the defence might well have failed to meet it.' Such was the narrowness of the margin. Sir Robert was also able to demonstrate that at no time had the Air Ministry come up with the idea of radio-detection until he first mentioned it. The secret of radar was first brought to the notice of a surprised British public in June 1941, when Lord Beaverbrook coined the term radiolocation. Later the Americans streamlined this to radar.

It is remarkable that the Germans, who also had various kinds of radar, were years behind the British in their application. The fault lay more in the conceited folly of the Nazi High Command and their inadequate grasp of the role of science than in the quality of the German scientists. During the Battle of Britain Goering was obsessed with the idea of shooting down fighters in the air and failed completely to realize how much more effective it would be to cripple the radar system and sector operations rooms. In the scientific battle of wits the Germans were thoroughly beaten. One

attack in August 1940 on the radar station at Ventnor succeeded in knocking it out, but by sending out impulses on another transmitter Fighter Command fooled the Germans into thinking that their raid had been unsuccessful. So it was that Goering committed his cardinal blunder and decided to stop attacks on radar stations 'in view of the fact that none of those attacked so far have been put out of action'. Churchill, for all his non-scientific background and for all that he may on occasions have been misled by the emotional dogmatism of his principal adviser, the 'Prof', Lord Cherwell, was alive to the role of science in war time. In Britain the High Command used scientists for advice and suggestions, whereas the German scientists were treated as servants and stooges. In Germany a variety of scientific projects, notably radar and atomic research, were frustrated by being fragmented. In Britain research was co-ordinated and to great effect.

In all something like £500 million was spent on developing and improving British radar up to 1945, as much as was spent on making the atomic bomb. Its war-time role was scarcely less decisive. The use of shorter wavelengths—centimetres instead of the metres used in 1940—made radar much more selective in the objects it picked up. One key discovery was the cavity magnetron, a device not unlike a copper flute which whirled electrons round so as to produce very short wavelengths of very great power. An object the size of a briefcase could equal the power of a large radio-transmitter. Watson-Watt called it 'the radically new and immensely powerful device which remains the heart of radar'. The Americans called it 'the most valuable cargo ever brought to the shores of America'. The Commission on Awards to Inventors gave the three men responsible, John (now Sir John) Randall, James Sayers and Henry Boot, £36,000. From the same device it was possible to develop precision 'blind bombing'. Radar thus became a weapon of attack as well as of defence. At sea too the invisible became visible, particularly U-boats when they surfaced at night to recharge batteries. These were weeded out by radar, often

with their commanders having no idea of how they had been discovered, for U-boats were unable to pick up radar on centimetre waves. In six months in 1943 Allied shipping losses from U-boat attacks dropped from 700,000 to 100,000 tons. Radar played a decisive part in hunting down the *Bismarck* and the flying bombs. The invasion of Europe might have failed without the subtle duping of the enemy which radar made possible. In the end the British lead in radar was outstripped by the Americans—at least in the opinion of Sir Robert Watson-Watt.

Today radar is the greatest boon to navigation that mankind has ever known. Literally scores of radar systems are used and its different applications run into thousands - as Sir Robert was to discover personally when he was caught in one of the early radar road speed-traps. Thanks to radar a whole new field in electronics was opened up. The impact on British exports has been immense. Decca Radar is the world leader in marine radar, having clocked up sales of some 40,000 sets. Sir Robert, after a spell of living in America, returned to Britain where he died in 1973 at the age of 81.

Chapter 36

THE TEN-MILLION-TON TEASPOON

Sir Martin Ryle, the fair-haired, youthful-looking (though he is now in his fifties) Professor of Radio Astronomy at Cambridge, was sitting in his study at the Cavendish; it is an historic room, for it once belonged to the great Rutherford, though the décor is a bit more lively than in his day; Sir Martin has some gay impressionist-style paintings by his wife on the wall. We were drinking coffee and presently he held up his teaspoon. 'If that spoon had part of a pulsar in it instead of coffee, do you know it would weigh as much as ten million tons?' That is just one of the mind-boggling facts about the universe that the young science of radio-astronomy has revealed.

The pulsar, a strange kind of rapidly spinning star of incredible density, was first discovered by two astronomers at the Cavendish in 1968. It is almost impossible to grasp the idea of the contents of one spoon weighing as much as 150 ships the size of the *QE2*. Yet at the end of its life, say after 100 million years of spinning, this dense mass just seems to disappear. Not only does the ordinary mind find such a phenomenon hard to grasp but equally some of the laws of physics are not adequate to explain it. 'We may find in the next decade or so,' says Sir Martin, 'that some of the traditional laws of physics will have to be rewritten.'

Radio-astronomy is probably the most revolutionary and significant branch of pure science to emerge since the Second World War, and the British contribution, through men like Sir Martin and Sir Bernard Lovell at Jodrell Bank, has been predominant It has given man a new, fuller and very different picture of the universe. It is as if a very shortsighted man were suddenly to be given a pair of pebble-glasses that restored his vision to normal. The analogy is not exact because

you cannot look through a radio-telescope and see things in the way you can through an optical telescope. Radio-telescopes are made of wire mesh; they are in fact a collection of very powerful radio aerials for gathering radio waves from the stars, whereas optical telescopes are made of glass and gather light waves from the stars. Yet radio waves, like light waves, which can be seen with the human eye, are only part of the vast spectrum of electromagnetic waves which start with very short gamma rays, go through visible light and on into radio wavelengths like the 1,500 metres of the long wave and beyond that.

A little elaboration will be useful. For 4,000 years man observed the heavens with the naked eye. In 1609 Galileo first used a telescope and for the next three centuries man's view of the heavens grew progressively more detailed as more and more was seen through more and more powerful telescopes. But when a star is too distant or weak to be picked up by its light waves it still emits radio waves (as indeed does our own sun), which can be received by radio-telescopes. In essence the radio-telescope is a glorified short-wave radio receiver, though it is a billion times more powerful, and it has the ability to separate and resolve a distant radio signal down to six seconds of arc. (If the area of vision is represented by a full circle then one second of arc represents one 1,300,000th of the full circle.) The radio-telescope has opened up an entirely new vision of the universe in the last quarter of a century, yet a more perplexing one than man ever perceived by viewing it optically over 4,000 years.

Let us look for a moment at the nature of light and of electro-magnetic waves generally. As the Cavendish's James Clerk Maxwell pointed out a century ago in 1873, light is a form of electro-magnetic radiation. It is like a series of very small waves, the distance from crest to crest being the wavelength. The wavelength of a red is 7,000 Ångstrom (or 75 millionths of a centimetre), and as we move through the spectrum – red, orange, yellow, green, blue, indigo and violet (Robert Of York Goes Bathing In Venice)—the wavelength

grows progressively shorter down to violet at 3,900 Ångström. But what we can see, namely the colours of the spectrum, are like one octave, or perhaps just a note, call it middle C, on a very large piano. Shorter than violet is ultra-violet, followed by X-rays (now of great interest to the astronomer, for stars emit X-rays too, although since these are largely stopped by the earth's atmosphere the main astral emissions must be recorded by satellite), followed by gamma rays and on into the unknown. That represents the treble end of our cosmic grand piano. Now let us return to middle C, or the visible spectrum, where the colour red has the longest wavelength. In ascending order of wavelength we have infra-red waves, heat waves, spark discharge, radar waves, television waves, short radio waves (starting at around ten metres) going up to radio waves on the long wave at 1,800 metres. And beyond.

Our cosmic grand piano playing its astral concerto has, for all we know, a keyboard of infinity. But for the moment at least the wave band of interest to radio astronomers is from three centimetres up to about thirty metres. Quite a few stars that can be picked up optically can also be 'heard' by radio-telescope (stars do not, of course, emit sound waves but the radio waves that they emit can be converted into sound just like a man-made broadcast signal). The effective range of the optical telescope is around 4,500 million light-years, whereas the radio-telescope, picking up signals from galaxies with a million times greater radio emission than our own galaxy, has recorded signals over 9,000 million light-years distant. A light-year is the distance that light will travel in one year Since light travels at 186,000 miles per second, a light-year is 186,000 × 60 × 24× 365 miles. The farthest measurable extremity of the universe is 10,000 million light-years or 58,000 million million million miles. In comparison our own Milky Way galaxy, of which the Sun is a modest member among 100,000 million other suns, is just 100,000 light years from end to end. Even this is beyond most people's comprehension. For suppose that our Sun, nearly a million miles in diameter, was the size of a football.

Then the earth, a good deal smaller than a pea, would be about 1,000 feet away. The farthest planet, Pluto, would be about a mile away, the nearest star (4¼ light-years) on the other side of the Atlantic, and our own modest galaxy, on this scale, would extend far beyond the orbit of Jupiter. Therefore to double our perception of the universe, as radio-astronomy has done, from 4,500 million light-years to 9,000 million is a giant leap.

Forty years ago no one had ever heard of radio-astronomy, although certain percipient nineteenth-century geniuses such as Thomas Edison and Sir Oliver Lodge had speculated on the possibility of long-wave radiation as well as light waves emanating from the stars. Then in 1932 an American, Karl Jansky, working on short-wave receivers with a view to improving reception, discovered to his surprise and quite by chance that the Milky Way, besides emitting light waves that could be seen, also emitted radio waves that were converted into sound by a very powerful radio receiver such as his with a directional aerial. The discovery, although well publicized at the time, attracted almost no scientific curiosity. Thirty years ago there was still only one radio-astronomer in the world, an enthusiastic American amateur called Grote Reber. From that point on the radio-astronomy story belonged primarily to Britain, thanks to research into radar.

On 26th February 1942 radar operators all over the country reported that the noise level on their sets had all but hit the roof. Interference caused by Nazi Germany was at once suspected. J. S. Hey of the Army Operational Research Group, who was collecting information on the efficiency of all radar sets, came across these repeated reports of enemy jamming of sets. He investigated. It was possible to get several 'fixes' on the source of the electrical noise, and when Hey collated the reports he found the source was not Nazi Germany but the Sun. The electrical noise was caused by radiation from an erupting sunspot in the metre wavelength region. Hey was the first man to discover that the Sun broadcast radio signals. He also discovered radio echoes from meteors and after the war went on to plot the first

fairly comprehensive radio map of the Milky Way. Hey, now retired from the Royal Radar Establishment at Malvern, was also the first to get a signal from the constellation of Cygnus, Cygnus A, one of the strongest of the radio galaxies.

Hey's remarkably pioneering work was now continued by Ryle at Cambridge and by Sir Bernard Lovell, operating at that time from an old shed at Jodrell Bank, with trailers and equipment bought and borrowed from the services. Both were old radar hands who had spent the war designing radars and devising means for outwitting the Germans, but a quarter of a century ago they were lone voices in an infant science detecting even lonelier signals from the depths of space. The new science of 'blind' astronomy was born.

'For the first ten years,' recalls Sir Martin, 'we were floundering, not quite certain what we should be looking for and with very little money.' Then as the importance of the subject became increasingly demonstrated the money began to flow. The Mullard radio firm, with the support of the Science Research Council, financed a £100,000 radio-telescope at Lord's Bridge, five miles south-west of Cambridge. 'The next fifteen years saw us operating with a very fair degree of purpose. The next decade will see fundamental discoveries in physics.' In the first two decades of radio-astronomy after the war Ryle, now in his fifties, and Lovell were the two leading 'space twins'. Ryle was awarded the Henry Draper medal of the National Academy of Sciences, America's foremost scientific body, for his 'outstanding achievements' in astro-physics.

Both Ryle and Lovell owe a debt to the first Russian Sputnik of 1957. Mysterious contraptions for sounding outer space mean little to the general public (and taxpayer) until they can be identified with something concrete like tracking a satellite. This indeed was what Ryle and his associates did, spending several sleepless nights recording Sputnik's orbit with an improvised aerial rigged up at the back of a Rugby pitch. Sir Bernard was not merely helped by the Sputnik—he was saved by it.

For a decade this pink-cheeked enthusiast with a West

Country burr from his native Gloucestershire had plotted and planned for his 250-foot dish, which is still the world's largest steerable telescope. As he records: 'I was like a wild animal, wanting nothing but the telescope, and I was to leave plenty of wreckage around me.'[1] Few scientists appreciated his purpose, and the Government gave little money, although Lovell was fortunate to have the backing of his then superior at Manchester University, Professor Patrick Blackett. The entire project almost ended in fiasco. It took Lovell's single-minded obsession that Britain and science needed a big radio-telescope to keep it going.

Early estimates of the cost were wildly optimistic: strikes, delays, inflation, the necessity to redesign equipment to keep it technically ahead of rivals—all contributed to spiralling costs. At one point, incredibly, Sir Bernard thought he might have to go to prison for overspending on the project. The telescope, twenty-five miles south of Manchester, was half paid for by Manchester University and half by the Government. It cost £750,000; the present cost would be five times that sum. 'But,' said Sir Bernard as we sat talking in his office overlooking the offending 250-foot dish, 'we'd overspent by a quarter of a million. The Treasury finally agreed to pay half the extra cost but imposed insulting conditions. I regarded these terms, and still do, as politically disgraceful.' An extraordinary legal tangle followed in which Sir Bernard was informed he might face a writ for a third of a million pounds. 'And if I couldn't pay, as I obviously wouldn't be able to, I might be sent to prison.'

What finally saved the entire project and Sir Bernard's career was the sudden international acclaim for Jodrell Bank when, in tracking the Sputnik, it became the eyes and ears of a world anxious to hear news of a great space event. In 1960 came the American space probe Pioneer V and sightings by Lovell made Jodrell Bank still more of a household name. Government pique was damped by public acclaim. Motor magnate Lord Nuffield offered to pay off a £50,000 outstanding debt. The dish was saved and Sir Bernard (he

1. *The Story of Jodrell Bank*. Oxford University Press, 1968

was knighted the following year), still a free man, went back to his proper job of probing the universe. He is a family man with five children and a passion for classical music and cricket. He is also a religious man. 'It has more to do with my upbringing—my father was a Methodist preacher—than any study of astronomy. I don't believe, however deeply we probe, that astronomy will ever answer the ultimate question about the creation of the universe.'

Despite the vast outpouring of cash which has gone into radio-astronomy in America (the United States Navy's 600-foot radio-telescope dish had to be abandoned after £60 million had been spent) Britain still retains her lead. Whereas the Americans opted for a very large dish, right from the beginning Ryle's choice was a different and much cheaper principle, the aerial synthesis telescope. Space radiation is plainly very feeble compared with a man-made signal. Either one has a large dish like Sir Bernard Lovell's or else one opts for the unfilled aperture telescope, using an interferometer aerial system.

Pause for breath. These are not easy concepts for the layman, but the basic principles can be grasped. Let us look first at the interferometer, first effectively applied to radio-astronomy by Ryle. When radio waves meet they are said to interfere sometimes constructively as when the crests coincide, which results in a powerful emission, sometimes destructively when a crest meets a trough and the effect is for one wave to cancel out another. By placing two aerials some distance apart it is possible by manipulation to get them to interfere either constructively or destructively. By intricate manipulation, with the distance between the aerials precisely known, it is possible to determine very accurately the position of a radio source.

An extension of the interferometer principle is the aerial synthesis radio-telescope—another Cavendish invention evolved by Ryle and others. Sir Martin calculated that one relatively small aerial, say a sixty-foot dish made of aluminium mesh, could be moved about in relation to one or more fixed aerials, also sixty-foot dishes, so as to simulate the

effect of a complete or fully filled-in dish telescope one mile in diameter. Here is how it works. On the first day the rotation of the earth moves one dish around the other and fills in a ring of the large equivalent telescope. Next day the movable dishes are shunted down-line a little to build up the next ring of the telescope, and so so. By combining in a computer each day's readings over a long period a picture of the radio heavens is achieved with the same resolving power as a mile-diameter dish telescope and the sensitivity of a 1,200-foot dish.

When we remember the £60 million it cost the Americans to build an unworkable steerable dish of only 600-foot diameter the magnitude of Ryle's achievement (at a cost of £500,000) can be truly gauged. The fact is that except at astronomical cost and probably not even then—it is impossible to make a very large dish to the required standards of accuracy. Make it light and it shimmers in the wind, yet the maximum permitted tolerance is only about one centimere from tip to tip Make it heavy enough to stop shimmering and inevitably it distorts under its own weight. Ryle did an exercise in 'lateral thinking' and evolved a completely different method of achieving the same effect.

Three other highly interesting telescopes of the aerial synthesis type have now been completed. There is the 'half-mile' telescope for observing galaxies. There is also a four-acre conglomeration. This is for studying quasars, those intensively bright quasi-stellar objects, perhaps as much as 9,000 million light-years from earth and moving outwards into the oblivion of space at velocities of up to 177,000 miles per second, or very nearly the speed of light. This is the speed of quasar OH471, identified by British and New Zealand astronomers working in Arizona in 1973 following information received from Malvern. It is the most distant object thus far discovered in the universe. (No object, as Einstein demonstrated, can ever travel as fast as light, because as this speed is approached the mass increases critically so that any further increase in velocity becomes impossible.) The four-acre telescope also discovered the ultra-dense

pulsars. In service in 1972 is the daddy of them all, a new £2 million telescope consisting of four fixed and four movable aerials mounted on a five-kilometre track on a strip of land which used to be a railway. This has the same resolving power as a three-mile dish In more concrete terms this telescope could distinguish two candle flames a few inches apart at a distance of ten miles. The prospective astral harvest resulting from this is a rich one.

But the existing achievements of the Cavendish men are considerable enough. They identified and mapped the structure of such famous radio sources as Cygnus A and Cassiopeia A They discovered the scattering effect of the Sun's corona or outer heat-ring on radio waves from distant sources, the so-called 'solar wind', which has proved a useful tool in investigating the structure of quasars They have made a series of catalogues of radio sources. After 1C and 2C came 3C, which catalogued 471 source positions up to 1959. This was superseded by 4C completed in 1964, which listed 5,000 new radio sources and 90 per cent of such stars or quasars had never been observed before. On the time-scale involved – up to 9,000 million light years – what we are receiving is a picture of the universe as it was.

Deep surveys of small regions of the sky (5C) reinforce the view that the universe started with a Big Bang from primeval matter. This is the view of Ryle and most orthodox cosmological thought. Observations show that we are living in a changing universe and that radio galaxies were different, being either more numerous or more powerful, in the past. An alternative theory to the Big Bang is the Oscillating Universe, in which the present period of expansion might be followed by a period of contraction. However, Professor Fred Hoyle and Hermann Bondi with all the adroitness of medieval disputants cling to the Steady State theory, which postulates that the universe has no beginning and no end; they argue that the expansion which we see is compensated by the continuous creation of matter in the spaces of the universe. This new matter comes together in galaxies over an immense span of time, then explodes itself and scatters

far out into the universe. How matter is continuously created from nothing is not satisfactorily explained. So one puzzling phenomenon (the Big Bang) is substituted for another yet more puzzling.

The reader, if he has not already done so, may well be asking at this point how we know the distance and velocity —and even mass —of such phenomena as quasars and pulsars. The most useful tool in analysing a star is to look at its spectrum. The phenomenon known as the Doppler effect, familiar to all who remember a little elementary physics, comes usefully into play. Listen to a whistling railway train speed up to the platform: the whistle rises in pitch as it reaches you, only to fall in pitch as the train goes away. The pitch alters with the speed of the approach or recession. So it is with light waves from the stars under spectral analysis. The spectrum of a star is crossed by several dark lines owing to the absorbing effect of the elements of which the star is made. When elements are in a gaseous form they absorb light at a particular wavelength which gives a recognizable spectral line. The faster a star is receding the more its spectral lines shift towards the red end of the spectrum, which is the long end of the wavelength. This phenomenon, known as the red shift, shows how fast a star is receding. In short the spectral line associated with a particular element is analogous to the pitch of a train whistle. It is the astronomer's most valuable tool of measurement, for the total light from the star is like the general noise of the train, and it would not be easy to detect the pitch of this as it passes.

On average it is also true to say that the brightest stars in any galaxy have roughly the same intensity, so by measuring the brightest star in a galaxy we can determine the distance of the whole galaxy. Each star emits maximum energy on a characteristic colour wavelength, nearest the blue for very hot stars (around 34,000° C.), nearest the red for 'cooler' stars (down to 5,000° C., which is still about double the heat of an electric furnace). A classification of stars according to eleven main spectral classes has been made, starting with the hottest: W, O, B, A, F, G, K, M, R, N, S (Wow,

Oh be a fine girl, kiss me right now smack! The smack denotes the cool end of the relationship). Each group has ten sub-groups 0–9, and our own Sun, a very average star in a very average galaxy, occupies a very average position at G2.

These spectral characteristics tell us more than temperature. By measuring a succession of red shifts the American astronomer Hubble worked it out that the speed at which a star is receding is directly related to its distance. Thus the greater the speed of recession the bigger the red shift and the bigger the distance. This factor, known as Hubble's Constant, though subject to certain qualifications, has not been fundamentally challenged. Recessional velocities of about 85,000 miles per second, or not quite half the speed of light, have been recorded for optical galaxies. The first quasar spotted in 1963 showed a colossal red shift, which meant it must be thousands of millions of light-years away. All quasars show red shifts; none show blue. Measurements taken by Sir Bernard Lovell's radio-telescope at Jodrell Bank were a vital factor in the discovery of the quasar, at America's Mount Palomar. It can now be inferred that some quasars are as much as 9,000 million light years away and moving at four-fifths the speed of light. Calculations show that for quasars to emit the fantastic energy they do, they must be superdense.

But denser yet, as we have already seen, are the pulsars. The identification of the pulsar was an ingenious piece of detection by the Cavendish team. It began with observations late in 1967 by a post-graduate research student, Jocelyn Bell, who found that she was getting very fast fluctuating weak signals, which at first she thought might be man-made radio interference. No joke this. Much excitement was caused at Jodrell Bank once when one of Sir Bernard Lovell's assistants was baffled by a mysterious bleep occurring every Thursday night. Lengthy research finally tracked this down to the activities of a courting farm-hand who left his motor-bike running near the Jodrell Bank telescope while kissing his girl friend good night.

But to return to the pulsar. Miss Bell noted that after a

few weeks the signal was not regularly there, it occurred only when the radio-telescope was pointed in a certain direction. More significantly, the time at which the bleeps occurred shifted progressively by four minutes a day, which suggested that the source was not man-made or even within the solar system. The observations reported and recorded by Miss Bell convinced her immediate superior, Dr Anthony Hewish, that here indeed was a most unusual radio signal coming from outer space. Special observations revealed the incredible regularity of the bleeps or pulses one every 1·33 seconds. But Dr Hewish maintained secrecy for several weeks until sure that these were not mysterious signals from 'little green men' or their equivalent in some other part of the universe.

In any event the truth about pulsars was scarcely less spectacular than proof of intelligent life outside the solar system. Dense stars are those in the last throes of life—say the last 10 per cent of a life span covering several thousand million years. A star is formed from a coming together of nebulous gases, which gradually compress into more solid matter by the burning up of nuclear fuel As a star exhausts one kind of nuclear fuel so a progressive gravitational collapse ensues. This raises the temperature of the core so that another stage of nuclear reaction—burning the ash of previous processes—begins to occur. The H-bomb type fusion produces helium ash, which in turn becomes carbon over a period of many million years, through oxygen, neon and magnesium to sulphur and the final reduction to iron 56. Thereafter the star can obtain no more energy from nuclear reaction because fusion of iron absorbs rather than creates energy.

The transition from one process to another can cause violent instability in a star, causing it to flare up as a nova, which can mean increasing brightness to 100,000-fold as well as the ejection of considerable quantities of matter. Sometimes a star compresses into quiescence as a white dwarf. Alternatively its outer core can shatter itself into smithereens, a major solar catastrophe known as a supernova explosion.

But the inner core suffers a runaway implosion—the ultimate compression of a superdense bundle of neutrons. The electrons which normally surround the atom and account for its being largely space have simply been overwhelmed. This could well be the origin of the pulsar. A tightly spinning orb, perhaps as much as a hundred miles in diameter and sometimes spinning as much as thirty times per second, would fly to pieces unless it were made of extremely dense material. Hence the ten-million-ton teaspoon.

To Ryle the universe is a vast working laboratory, with conditions at once more extreme and interesting than anything that could be simulated on this earth, and for this reason new theories can be examined which it would be impossible to test in a terrestrial laboratory. The emission of electrons from a supernova event exceeds anything Harwell could produce. The concentrated mass of neutrons that make up the pulsar may well contain elements with superheavy nuclei, not yet synthesized in an earthly laboratory.

Radio-astronomy today is a well-endowed science, and Ryle, somewhat to the envy of some colleagues, has had fairly generous financial aid from public funds. 'I'm not a politician,' he says. 'I hate wandering through the corridors of power to get money. Lovell is different He loves a battle.'

Britain has also taken a world lead with the first electronic stellar-measuring machine, known as Galaxy, to interpret star photographs. This 'robot' astronomer is installed at the Royal Observatory, Edinburgh, and has begun the first real census of the stars, and is indeed able to measure more star images in a single year than all the world's astronomers have made this century. Galaxy (it stands for General Automatic Luminosity and XY, which means it measures brightness and the X and Y co-ordinates that disclose a star's position) was first thought of by Dr Peter Fellgett, now Professor of Cybernetics and Instrument Physics at Reading University. 'A good telescope can photograph 100,000 stars in five minutes, but it then takes a man several years to measure and record the stars on just that one plate,' he ex-

plains. Since this was impracticable astronomers tended to concentrate on the oddities and freaks.

Dr Fellgett's idea, later perfected by an electronics firm, Paul Coradi-Scotland Ltd, consists of a cathode-ray tube scanning the thousands of star images on a photographic plate and interpreting them automatically. Linked to a computer Galaxy can find and tabulate up to 10,000 stars an hour, something that a man would need months to do. In addition the machine spots star images too faint for the human eye even on a photographic plate. These include stars buried in clouds of intersellar dust, which could be the exciting environment where new stars are constantly being born. Nearest American competitors to the machine involve manual work and are much slower. Galaxy has great export potential in the growing field of automated equipment for astronomy.

Chapter 37

DISCOVERING THE SECRET OF LIFE

One winter lunchtime early in 1953 at the Cavendish laboratory's 'local', the Eagle, a red-haired scientist in his thirties called Francis Crick bounced into the pub for a pint and announced in a booming voice that he had 'found the secret of life'. It was a big claim, and it happened (in the scientific sense) to be justified. Crick, and his youthful co-worker James Watson, a tall, relaxed-looking American then in his twenties, had finally succeeded that very morning in unravelling the shape and substance of the mysterious molecule DNA, present in every human cell, which contains the 'key to life', Sir Lawrence Bragg, in calling it 'the most important single scientific discovery of the twentieth century', added that it 'has led to a veritable explosion of research work in the biochemical field, which in a few years has transformed our knowledge of life processes.' [1]

DNA stands for deoxyribonucleic acid. This is the substance of which genes are made, and understanding its structure enables us to understand how the genes determine our characteristics from the colour of our hair to the length of our nose or the level of our intelligence. It explains the principles of heredity and growth. A single cell, in say a mother's womb, contains the complete genetic code or blueprint for the physical development of the child.

Some say that understanding the DNA code will one day enable mankind to play God, to alter people's personalities by tampering with the code, perhaps eventually to create completely man-made human beings. The first synthetic genes have now been made, and at Oxford several years ago a way was found of making hybrid cells, part rodent, part man. But the transition from a cell to what we would call a

1. *The Times*, 16th May 1968.

living creature is a big one and the technical problems are formidable. Anyway, why should science bother to produce a botched monster when it is easier, more efficient – and more pleasurable – to produce human beings by more conventional means? Past experience suggests that many fears about genetic engineering are exaggerated. But the practical possibilities in the fields of, for instance, cancer cures and immunology as well as the research implications make the discovery of DNA's structure a profound and massively fruitful scientific breakthrough.

Crick and Watson were in 1962 awarded the Nobel Prize for medicine, as was New Zealand-born Maurice Wilkins of King's College, London, who supplied the X-ray data which prompted, and confirmed, the rightness of the Crick / Watson model of the DNA molecule. Since then, following in Crick and Watson's footstep's, half a dozen more scientists have won Nobel Prizes in the field of biochemistry.

Crick and Watson's brilliant research showed that the DNA molecule was a double helix; it was a beautiful and essentially simple structure something like a spiral staircase, and they could see too that it had a perfect code for duplicating itself.

Consider for a moment the nature of the cell. It was a seventeenth-century Englishman, Robert Hooke, who first discovered the existence of cells when he sliced a thin section of cork and under the microscope found it to consist of a great many little pores, or boxes, which he christened cells. We now know that all living organisms with the exception of viruses are constructed of cells. There are two basic constituents of the cell, the cytoplasm and the nucleus. The cytoplasm, which surrounds the nucleus, is largely protein and performs most of the working functions of the cell. The nucleus, a minute central core of the cell, contains the all-important nucleic acid of DNA. This DNA works in conjunction with enzymes (the biological catalysts in cells which induce chemical change without actually changing themselves) and provides all the instructions necessary to shape the cell; DNA also contains the mechanism for re-

producing itself exactly. In every cell in every living thing there is a complete blueprint for the body's entire shape, nature and character. When a fertilized egg develops in the womb, it at first divides into a series of identical cells; later, in a way still not fully understood, a process of cell-differentiation takes place, so that some cells develop in one way to make, say, skin, and others develop in another way to make muscles and so on. Though each cell still contains the complete blueprint it somehow 'learns' to select only that information relevant to duplicating itself; so, for instance, a muscle cell continues to replicate muscle cells, skin cells to replicate skin cells.

When a cell divides or multiplies the nucleus transforms itself into a batch of small threads known as chromosomes, which are composed of tiny ribbons of protein and nucleic acid. A chromosome is to a gene as an hotel might be to an individual bedroom. Even smaller substances known as nucleotides are like the individual bricks of the building. The chromosomes replicate themselves exactly before splitting apart to form two new cells. This is the cell-splitting process known as mitosis. The human cell has forty-six chromosomes.

In reproduction something different takes place; this is not a splitting of the cell but a fusion of two cells, taking twenty-three chromosomes from the male sperm and twenty-three from the female egg. These forty-six chromosomes carry from generation to generation the blueprint, or code, of all hereditary material contained in the human body, from the size of the big toe to the depth of a dimple. But how? Until 1915 or so the chromosome was thought of as a solid thread. Then it was found to be more like a necklace of beads, as many as 1,250 per human chromosome: the beads were called genes and came to be recognized as the real sources of heredity. Strong genes, like genes of tallness, are known as dominant genes, and usually overwhelm genes of shortness, which are known as recessive genes. Even so the exact chemical structure of the genes and the mechanics of replication were obscure. Some thought proteins were the potent agent

in transmitting genetic information; others said that it was nucleic acid and it still required Crick and Watson's ingenious structural analysis to provide the genetic code.

The final solution of the DNA riddle came quickly, from a flash of inspiration on that winter morning of 1953, as Watson toyed with a model of the DNA chain made from cut-outs of stiff cardboard. But the flash was preceded by eighteen months of hard striving, strained tempers, professional jealousies, personal conflicts and a good many false trails. Even so Crick and Watson seem to have had plenty of fun. They were two 'Lucky Jim' characters who regarded their venerable superior, Sir Lawrence Bragg, director of the Cavendish, as something of an old fuddy-duddy. 'When I got to Cambridge in 1951 I thought anyone who was over forty was useless,' recalls Watson. Crick's recreations are listed in *Who's Who* as 'conversation, especially with pretty women'. Watson, who as a professor in his forties was to marry an undergraduate bride half his age, confesses to having spent a fair portion of his time at Cambridge in pursuit of the au pair girls. 'Scientific discovery is a bumbling process,' he explained. 'The important thing is to have time to be bored, because it forces you back on your science.'[2]

Time to think; time to have fun. But both Crick and Watson had another quality essential to revolutionary work in scientific research: arrogance. 'Unless you have egotism and arrogance you won't get places,' says Watson. 'It's what you like to find in a pupil and also dread in him, because it's difficult to handle. But there has to be this arrogance to reject what's gone and find something fresh and good. We were like two naughty schoolboys with a manic obsession.' Sir Lawrence found Crick especially hard to tolerate. In his book *The Double Helix* (1968) Watson has given a delightfully frank and faintly scandalous account of this momentous period of research. There was a big row with Sir Lawrence: 'Don't rock the boat, Crick,' he said. Then Crick and Watson built an unsuccessful DNA model which was inspected and smartly dismissed as unworkable by the rival

2. Conversation with the authors, 15th May 1968.

faction at King's College—Maurice Wilkins and his formidable and somewhat difficult feminist colleague Dr Rosalind Franklin. At this point Sir Lawrence ordered his two problem charges to stop work on DNA. They had thrown up little of value, and Bragg felt it was not quite cricket for them to duplicate the extensive prior investment in DNA at King's.

But Watson and Crick continued their work in secret—even though Watson was sacked by his money-paying masters in Washington. He should have been studying biochemistry in Stockholm, not DNA in Cambridge. But though his fellowship award was slashed he managed to get by. For twelve months the two of them had been stuck, following false clues and reaching wrong structures. Lunchtime pints at the Eagle became a gloomy affair. They had a rival in America, the great American chemist Linus Pauling. He produced a structure for DNA, but Watson and Crick discovered it contained an elementary flaw. They celebrated his failure in the Eagle this time with whisky. Now that Pauling had emerged as another rival Bragg relented and gave his blessing to Crick and Watson's researches. Then came the revelation of the double helix. It was a solution so beautiful and perfect that it had to be true. Sir Lawrence had written: 'There is a feature common to almost all great discoveries in science. When the answer is revealed it is both completely unexpected and so dazzlingly simple that it carries immediate conviction. The DNA structure is no exception.'

We have likened the double helix to a spiral staircase. The outsides of the staircase, the banisters so to speak, are composed of alternating groups of phosphate molecules, and sugar molecules of the kind known as deoxyribose. The 'steps' of the staircase are composed of four nitrogen compounds: adenine, thymine, cytosine, and guanine. (A, T, C, G, for short.) Because of their chemical nature A will pair or bond only with T, and C will pair only with G. Thus each step, known as a base pair, can either be an AT step or a TA step or a CG step or a GC step. Supposing it were

possible to walk up the DNA staircase A, T, C, G, we should find that though only four kinds of steps were possible, the steps can follow endlessly in any order GC, CG, AT, TA, CG, GC, CG, etc., and in fact fifteen pairs of positions can be combined in over a thousand million different ways.

Given that a single gene can be over 2,000 steps long the fantastic variety of possible arrangements means that every gene can have its special character. There is enough information in the DNA of a human cell to fill several sets of encyclopedias. Yet this human blueprint of the utmost complexity is concentrated in a piece of matter less than a 400-millionth of a milligramme. When a cell divides the DNA staircase starts to unzip down the middle of each step, A's separating from T's and G's from C's. Then each A picks up a new T, each G a new C, from the free-floating nucleotides (the molecular building-bricks) in the cell contents around it. In short the whole life process and conveying of hereditary information are determined by the sequence in which these simple chemical units string themselves along in the DNA chain. Incredibly about 250,000 base pairs are assembled each second in a mammal cell during DNA duplication. Besides replicating themselves the DNA molecules are the basic source of instruction for the synthesis of the twenty different amino-acids; these are the raw materials of the proteins which also make up a cell, and their nature and number were first drawn up by Crick and Watson. In this process the DNA uses a 'messenger', RNA (ribonucleic acid) which travels from cell nucleus into the outer part of the cell or cytoplasm where, carrying instructions derived from the DNA, it acts as a template for the synthesis of proteins in small spherical particles known as ribosomes.

Although not all of this was known to Watson or Crick in 1953 they had a very good idea of what their structure entailed and in their letter announcing the discovery to the world-famous scientific journal *Nature*, in April 1953, they contented themselves with the uncharacteristically modest note: 'It has not escaped our notice that the specific pairing

we postulate suggests a possible copying mechanism for the genetic material.'

Wilkins and his colleague Dr Rosalind Franklin found that their X-ray data confirmed the new theory of DNA's structure. Though Crick and Watson tend to dominate the story by virtue of their youthful egos, the work of the shy Wilkins and the temperamental Rosalind were vital. Wilkins, who worked on uranium in the war but had given it up because he found the atomic consequence repugnant, was rightly to share in the Nobel Prize. Rosalind Franklin died tragically of cancer when only thirty-seven in 1958.

Virtually all the work on the DNA breakthrough took place in Britain. It was Watson who prompted Crick's enthusiasm about DNA from 1951 onwards; but Wilkins had seized on the problem in his quiet way before almost everyone else, and as Watson generously records in *The Double Helix* it was Wilkins who first excited him about the value of X-ray work on DNA, which was to prove the essential tool.

In the years that have followed, Bragg's reference to 'a veritable explosion of research work' has been no exaggeration. Newer and yet more sophisticated information has been uncovered about the life process, and this work has been dominated by Crick's incisive mind. He is the acknowledged world leader in the genetic code. He calls his house, appropriately, the Golden Helix. As a militant atheist (who at one time resigned his fellowship of Churchill College because he did not want it to have a chapel) Crick relishes the prospect of a completely mechanistic explanation of Creation and the thought that man can play God. He is a shy, somewhat prickly individual and there were threats of litigation when Watson was planning to publish his controversial book. The potentially explosive episode was neatly defused by Sir Lawrence Bragg in his generous but acute foreword to the book.

Watson, who had at first dismissed Bragg as a 'fuddy-duddy', was to revise his opinion. 'I know now that Bragg was the second brightest man in Cambridge in the early

fifties. I'll leave it to you to guess who was the brightest.'[3] For Bragg it was also a triumph. Not only had the Cavendish once more scooped the world scientifically, and this time under his directorship, but in addition it had all been made possible by the X-ray method he had developed as a young man forty years before. Maurice Wilkins worked several more years confirming the features of the double helix before making an important contribution to the structure of RNA. As a professor at London University he is now researching into the operation of the nervous system.

3. Conversation with the authors, 15th May 1968.

Chapter 38

THE CARBON FIBRE STORY

They are silky jet black strands as fine as gossamer and readily broken. Human hair is eight times as thick. Yet, when you bond these magic filaments together with synthetic plastics, they can produce a new material, CFRP, four times stronger weight for weight than high-tensile steel. These filaments are carbon fibre, the revolutionary reinforcement invented by three scientists at the Royal Aircraft Establishment at Farnborough, Hampshire. CFRP stands for Carbon Fibre Reinforced Plastic. The fibre itself is made from a textile fibre such as Courtelle, which is 'cooked' under carefully controlled conditions to a very high temperature – around 2,500° C. Some, such as former Labour MP Brian Parkyn, who chaired a parliamentary sub-committee on carbon fibre, say that it is the most important development in materials for two hundred years Others have called it the greatest advance in its field since man-made fibres were introduced. It is probably the best reinforcement material anywhere in the world. The scope and export potential of this brilliant British invention are immense.

The most dramatic uses of carbon fibres for the moment are in aerospace, where every 1 lb. trimmed off the weight can be worth up to £20 a year on a subsonic plane and as much as £200 on a supersonic aircraft. When the price is sufficiently reduced by volume production CFRP will emerge as a major competitor to conventional materials in everyday life: in car bodies, refrigerators, washing-machines, boats, structural work, self-lubricating bearings, piston-rings, chemical process plant (carbon fibres are exceptionally resistant to strong acids)—anywhere in fact where stiffness, strength, durability and lightness are very important. One of the co-inventors of carbon fibres at the RAE, Leslie

Phillips, tells us: 'Even when we began we could see that this would become a multimillion pound industry. We are scientific but dedicated merchants. We don't just want to be bloody clever, we want the science to be used to create new jobs and new products. Already we're out of the laboratory and curio stage The next step is to make bigger and more efficient plants for volume production. Then we can begin to get the price down ultimately to around £5 a pound.'

At present carbon fibres are expensive—between £15 and £90 per pound, but the Atomic Energy Authority, which is working on development with the RAE, agrees, that the price could be reduced to £5 per pound or less. Experience with nearly every other material new in its time confirms this belief. Napoleon once had a dinner set made from aluminium because it was then so rare and expensive. Polyester plastics, once as much as £1.50 per pound, are now less than 10p.

Carbon fibre reinforced plastics employ a strengthening principle well known in nature—the alignment of fibres in one direction, just like a cane. Try snapping a cane and you find, considering the lightness of its structure, how difficult it is to do so. The cane does not break easily because the mass of uni-directional fibres which run down its length is bonded together by a natural adhesive, lignin. So it is with filaments of carbon fibre embedded in plastic. As long ago as 1921 a British scientist, A. A. Griffith, advanced the idea that drawing out glass into filaments would produce a new variety far stronger than ordinary glass. Today's glass-fibre and glass-reinforced plastics industries stem from this idea. Weight for weight there are notable gains in strength to be had from glass-reinforced plastics, but they lack stiffness, and where the stiffness to weight ratio is important metals have had to be used. By contrast, carbon fibre reinforced materials have higher values of stiffness to weight ratio; carbon fibres themselves are three to six times stiffer than glass fibres. As we have already noted, CFRP is also some four times stronger weight for weight than high-tensile steel. Inclusion of fibres in plastics substantially reduces the coefficient of friction and the wear ratio, sometimes to 1/1000th of the original. Wear

reduction works for metals too: 25 per cent of carbon fibre in copper reduces wear a hundredfold.

The carbon-fibre project began at Farnborough towards the end of 1963. The energetic Leslie Phillips, son of an East End master furrier, is an inventor with over sixty patents to his credit as well as the setting up of four new plastics industries. He and his co-inventors noted the enormous difference in strength and stiffness between carbon derived from a rayon fibre (a form of carbon which has a virtually random arrangement of carbon atoms) and the properties realized in a highly aligned and ordered arrangement of carbon atoms in the minute single crystals of graphite known as 'whiskers'. The latter were very much stronger and stiffer. The RAE men reasoned that by appropriate cooking it might be possible to avoid the usual higgledy-piggledy carbon atoms and create a disciplined and orientated line-up which would produce greater strength and rigidity in a new fibre. So it proved. The substance carefully chosen by Leslie Phillips was polyacrylonitrile, a textile filament widely used in industry, under the trade-name, among others, of Courtelle. The actual experimental work was performed by a Scot in his late fifties called Bill Watt, and his lieutenant Bill Johnson.

Watt is a world expert on carbon development and started work on carbon (which has a high melting point) for rocket use in 1952. He worked on special carbon tubes for high-temperature nuclear reactors and much of his studies have been taken up all over the world. Working in his rather cluttered little shed of a laboratory at Farnborough, Watt had produced his first carbon fibre within a few months. He has a somewhat reticent, typical 'boffin-like' air and claims to get many of his best ideas in the bath or while shaving in the morning. 'Many of the ideas for carbon fibre came to me in my bathroom, some from consciously thinking of the remaining problems or of improvements, some while not even consciously thinking of them.'[1]

It soon became clear that there was not just one carbon fibre but a whole family of them to be exploited each with

1. The *Daily Mail*, 4th December 1969.

a variety of different qualities suitable for a particular purpose. Leslie Phillips, who had previously worked on asbestos and glass-reinforced plastics, then worked out methods for embedding the carbon fibres in plastic to produce CFRP. There are several methods for doing this, using hot or cold-setting resins, of which the 'leaky mould' technique was the first to be devised. In this the resin it could be a liquid polyester which sets cold is poured into a mould and a weighed amount of fibres is added and allowed to soak. Pressure is then applied (a few pounds per square inch is often enough) which will squeeze away surplus resin. The resulting composite is CFRP. It is also possible to use injection-moulding with thermoplastics, filament-winding (where continuous fibres are wound round a cylinder) and the pre-preg method, in which veneers of resin-impregnated fibres are subjected to hot compression moulding, in hydraulic presses.

Already the relatively high-priced carbon fibres of the moment have proved themselves in dozens of practical ways. International sports and racing cars have benefited enormously. J. W. Automotives, working with Farnborough, used a carbon-fibre reinforced body for their Ford GT 40 car, which won the 1968 and 1969 Le Mans twenty-four-hour race. Previously a glass-fibre body weighing 153 pounds had been used, but the carbon-stiffened glass-fibre body using just three pounds of carbon weighed only ninety-three pounds. A steel body of equivalent strength and stiffness would have weighed 500 pounds.

These were not the only advantages. Glass fibres, not being very stiff, suffer from excessive noise or drumming, which also adds greatly to wear and material fatigue. Drivers of the GT 40 reported a much smoother ride exceptionally free from vibration, which also contributed to reducing their own personal fatigue.[2] 'This is just the opening of the curtain. What racing boys do today, the Austins and the production boys will be doing in ten years' time,' says Leslie Phillips. It has also been possible to improve the design and perfor-

2. L. N. Phillips, in *Composites*, vol. 1, No. 1, pages 50–1; September 1969.

mance of racing canoes and kayaks, where minimum weight is required. If the weight of a glass-fibre boat is reduced too much, water pressures will distort the contours of the hull and the craft then moves more slowly through the water. But carbon-fibre-reinforced kayaks have much greater stiffness and lightness and as a result are now winning gold medals against international competition.[3]

Carbon-fibre golf clubs are lighter than standard ones and make possible the all-important increase in clubhead speed (scientist Bill Watt is a keen member of the North Hants Golf Club). Carbon fibres are water-resistant, good conductors of heat and electricity but chemically inert, so they will prove very useful in the construction of chemical plant. The National Research Development Corporation, which was assigned the patent right in carbon fibre in 1967, has now granted manufacturing rights to three British companies, Morganite (Modmor) Ltd, Rolls-Royce and Courtaulds. Three American firms are now beginning to manufacture the fibre under licence in harness with their three associated British licensees.

As with any new material there have of course been snags. Carbon fibres, though very stiff, are also rather brittle. But they still promise a significant breakthrough in aero-engine technology, a fact realized in America as well as Britain. By using their carbon-fibre reinforced material Hyfil instead of titanium for the fan blades of their RB 211, Rolls-Royce hoped to save 300 pounds per engine. Unfortunately the blades proved too vulnerable when birds were sucked into the fan. Though this problem has now been solved it was too late to use Hyfil for the RB 211.

Elsewhere in the aerospace industry the manufacturers are working intensively on carbon fibres for the Harrier jump-jet and the Multi-Role Combat Aircraft. In America the Northrop company will use some five carbon-fibre components, perhaps as much as 300 pounds per aircraft. General Dynamics, who have already built an entire section of a wing from CFRP, hope the new material will improve the swing-

3. ibid., No. 2; December 1969.

wing of its F 111 fighter bomber. Now BOAC are buying from Rolls-Royce weight-saving carbon fibre floors for one of their Jumbo jets, which will enable extra passengers to be carried. This could be the start of a volume market for carbon fibre in aircraft like Concorde, the DC 10 and the European Airbus, with the chance to bring prices down sharply.

Currently Britain makes about 90 per cent of world demand for carbon fibres. World use is expected to rise to 1,000 tons, perhaps more, by 1980. From then on the element of ordinary everyday use will grow. Leslie Phillips, who has seven children, predicts: 'In my children's time carbon-fibre reinforced plastics will be a billion-dollar industry.' Not bad for a product less than a decade old. After all, concrete, which has been in use for 2,000 years, and glass for perhaps 4,000 years, are in some ways still in their infancy as regards development.

Chapter 39

BOOKS, BOOKMEN AND THE ANGLO-SAXON FACT

The British visitor to an international literary and trade gathering such as the annual Frankfurt Book Fair will be surprised, as he browses round the exhibition stalls of other countries, at how many books are translations from the English language. British authors are as numerous as the American, mass-selling fiction names like Ian Fleming, John le Carré, Graham Greene, Somerset and all the Maughams, Alistair Maclean, Daphne du Maurier and Agatha Christie.

The distinguished French author François Nourissier once declared[1] with a note of envy in his voice: 'You have at your disposal the greatest cultural community that has ever existed. It is physically impossible for an English speaker to understand what we feel in face of the Anglo-Saxon Fact. Every artist has a world scope now, but at the centre is that Anglo-Saxon Fact.'

Even in America itself, with its own highly vital literature, British authors enjoy a popularity almost as great as the domestic product. It is not uncommon to find more British novelists than American in any of the big United States best-seller lists.

This leading role in world publishing stems not only from the quality of Britain's writers, but also from the vigour and variety of her publishing industry, which produces over 30,000 titles a year. Britain's book sales now approach £200 million a year, of which almost half is exported. In fact allowing for the bigger discounts to foreign book-buyers this means that about one in two of all books produced in the United Kingdom is exported. This is a higher proportion than any other publishing industry and accounts for 1 per

1. *The Times*, 24th January 1970.

cent of all British exports. Indeed British book exports are only marginally less than American, despite the fact that the United States industry works from a domestic market four times as large.

Just as important as the physical value of exports is the fact that trade follows the book. British scientific and technical books predispose foreigners to buy British goods and machinery. English language textbooks as well as the more purely literary works help to spread British ideas, influence and way of life.

Leading exporters, largely because of their educational lists, are the academic Oxford University Press (70 per cent of output) and the 250-year-old family firm of Longmans, with 75 per cent sales overseas. Despite its amalgamation with S. Pearson (Publishers), which runs the *Financial Times*, Longmans had Mark Longman as its chief until his death in 1972 (the firm was founded in 1724 by his great-great-great-great-great uncle Thomas Longman). Family firms still retain an important segment of Britain's publishing industry, notably, the 200-year-old firm of John Murray, publishers of Byron, Darwin and many other key figures of the nineteenth century. There is, too, the 150-year-old firm of William Collins, which promotes with great expertise a whole range of best-selling authors like Alistair Maclean, Agatha Christie, zoologist Gerald Durrell and Joy Adamson, chronicler of Elsa the Lioness in books like *Born Free*. Chairman 'Billy' Collins, great-great-grandson of the Scots founder, another William Collins who was a Glasgow printer, presides over the fortunes of this private company (which yearly earns pre-tax profits of over £3 5 million) with paternalistic efficiency. The firm of Macmillan, strong in education and with big overseas interests, was started in 1843 by two young Scots booksellers, Daniel and Alexander Macmillan. A subsequent Macmillan of the third generation, Harold, became more famous in another sphere as Prime Minister, but both before and after his premiership he played an active role in the firm.

Though the number of completely independent firms has

declined, they are still sizably represented by such famous names as Faber & Faber, where T. S. Eliot was for many years a director and editor, J. M. Dent, who produce the more famous Everyman's Library series, Allen & Unwin and Hodder & Stoughton, all of whom have big educational lists.

American firms have become increasingly interested in acquiring a stake in British publishing. Understandably so. British books are the cheapest in the Western world and have the advantage of preferred access to the traditional and lucrative Commonwealth markets. Cassell, publishers of Sir Winston Churchill, have sold out to Crowell-Collier-Macmillan of America, which also owns three other British firms and has a substantial stake in a fourth, Routledge & Kegan Paul, which specializes in sociology books. Sir George Weidenfeld's firm of Weidenfeld & Nicolson is 39 per cent owned by the *Encyclopaedia Britannica*: André Deutsch is 40 per cent owned by *Time* magazine, but both men for the moment retain control and independence.

However, the truth is that individual flair and literary judgment count for much in publishing. Mass production can never be king in an industry which by its very nature consists of a series of 'one-off' products.

The paperback revolution came to Britain in 1935, when a thirty-four year old publisher called Allen Lane put on sale ten titles at 6*d.* each in what were soon to become the famous orange covers of Penguin Books. 'I wanted the same price as a packet of ten cigarettes so that no one could possibly say they couldn't afford them,' he explained. Their success was instantaneous. Sir Allen recalled getting off the bus at Selfridge's store in London at 9.15 a.m. on 30 July 1935, the first day of sale. The shop had already sold 1,000 copies—the first batch had been snapped up by the shop assistants themselves.

Sir Allen was a Bristol boy who left school at sixteen to work with his uncle John Lane in the publishing firm of Bodley Head. It frustrated him that often even good books only sold around 1,500 copies. There was a widespread feel-

ing that quality books were for the 'carriage trade'. Lane decided to change that by combining cheapness with mass sales and quality. This has been the highly successful Penguin formula ever since. The use of the Penguin symbol was a shrewd move. Sir Allen knew no one would remember to ask for a Lane book. 'It had to be an animal. The Dolphin and Phoenix were already taken. Then my secretary suggested Penguin. It had just the right touch of dignified flippancy.' The Pelican series, which embraces the 'cultural' range, was born very much by accident at a bookstall at King's Cross station, where Lane was waiting for an order. A woman rushed up and in some degree of confusion asked for 'the new Pelican series'. Though he knew quite well that there was no such thing as a Pelican, Lane was worried that a competitor might cash in on the Penguin trade mark by starting something similar, so he decided to pre-empt the Pelican title for himself. He started with two Shaws and H. G. Wells's *Short History*, and soon began commissioning his own books.

In 1941 the firm launched its tremendously successful Puffin imprint for children which sold over 4 million copies in 1971. In 1969 Sir Allen, a millionaire several times over, celebrated his fiftieth year in publishing with the 3,000th Penguin, James Joyce's *Ulysses*, a fitting choice since he was the first to publish the book in hard-cover in Britain more than thirty years before. Though Sir Allen retired from the managing directorship in 1969, he remained as chairman until his death from cancer in July 1970. At this point, and as a protection against American takeover, the firm amalgamated with Longman's.

Penguin's seemingly impregnable lead, with annual sales of 30 million copies, is the envy of competitors, including American firms who have tried with varying degrees of success to break into the British paperback market Much of the dominance is due to a backlist of some 3,000 titles, many of which, such as the Pelicans, sell a steady 20,000 or more a year. Currently some 60 per cent of turnover is in overseas markets. America is the biggest and most profitable,

but Penguin is well geared to meet the impending 'literary explosion' in India, Pakistan and South East Asia, where it sells special half-price editions from its backlist.

The firm has also had some long-running fiction titles; Orwell's *Animal Farm* and *1984*, John Braine's *Room at the Top* and D. H. Lawrence's *Sons and Lovers* have all passed the million mark. Its best-seller of all time is Lawrence's other famous novel *Lady Chatterley's Lover*, which in 1960 figured prominently in an obscenity trial. The eventual 'not Guilty' verdict was a landmark in the 'permissive revolution' and provided an enormous sales boost. The 'Lady' has now sold herself more than four million times.

After Penguin come Pan Books (annual sales 25 million copies) which is jointly owned by Collins, Macmillan and Heinemann (themselves part of the Tilling transport group). Pan operates in the more volatile field of contemporary best-sellers, in which James Bond still provides a handsome bonus—with sales by the end of 1970 of almost 30 million copies. The No. 3 paperback firm is Fontana, a wholly owned subsidiary of Collins with 20 million annual sales. Between them these three wholly British firms command some 65 per cent of the paperback market, and the only substantial American challenge comes from Corgi Books, a subsidiary of United States Bantam Books.

Only one in ten of the over-sixty-fives regularly buys paperbacks, but the figure is one in three for the under-thirty-fives. Inevitably books with an educational bias will figure large. Thus Panther Books (part of television tycoon Lord Bernstein's publishing empire) now have a Paladin series to rival Penguin's famous Pelicans. Britain may not be a nation of book-buyers—it is estimated that only one in six of the populace ever buy hard-cover books—though the proportion is far higher among the under thirty-fives. But Britain is most certainly a nation of book-borrowers and book-readers. The number of borrowings from the so-called 'free' public libraries (actually paid for from the local authority rates) has doubled since the war to 600 million per year—more than twelve a head for every person old enough

to read. Though neither publishers, authors nor booksellers are likely to grow fat from the public libraries, even with a Public Lending Right, their post-war performance argues well for the rising standards of literacy in the nation.

Chapter 40

THE NOVEL

A century ago Tolstoy decided that the novel was dead and turned instead to religious propaganda In recent times Gore Vidal, the American author of *Myra Breckinridge*, has proclaimed that the novel is dead except as an aid to masturbation. But the novel refuses to die. For millions of people, even in the television era, there is nothing to replace a good story unfolded on the printed page. Nor, contrary to Vidal's assertion, does a novel have to be a sex novel in order to succeed. William Golding's *Lord of the Flies* (1954), the story of the stranded schoolboys who turn savagely on one another, has not a stirring of sex in it, and was an established success before it became a film. Likewise Frederick Forsyth's international best-seller *The Day of the Jackal* sold for its thriller content; the bedroom scarcely came into it. 'Statistically there is no evidence that the novel is in danger—it constitutes around 70 per cent of public library borrowings,' says John Fowles, 'and for us writers it is most certainly not dead ' Fowles, a best-seller on both sides of the Atlantic, is proof of his own assertion. In short, people still want to read a story. Telling a story is the primary role of the novel, and it is worth pointing out that the English novel, one of the great glories of world literature, has also been at its most potent as a vehicle of ideas and a shaper of thought when it has told a good story.

After Jane Austen, in technique the first truly modern novelist, the novel came to its fullest flowering in the Victorian era with the work of the Brontë sisters, George Eliot, Thackeray, Trollope. And Dickens. To a remarkable extent Dickens has survived and conquered the world of mass communications—television, films and the musical of *Oliver Twist*. Nor has any man created more memorable characters

from Pickwick to the lovable, hopeless Mr Micawber waiting 'for something to turn up'. But we must confine our survey to writers who belong primarily to the twentieth century.

It seems natural to mention Herbert George Wells in the same breath as Dickens. Like Dickens, Wells was born into a family that knew poverty and debt. His mother had been a lady's maid, his father was a gardener, small shopkeeper and professional cricketer (then, as now, an ill-paid profession). Apprenticed as a draper's assistant, Wells ran away, won a scholarship to London University and studied biology under the great Thomas Huxley. He then proceeded to pepper the world with the fruits of his own experience and inquiring mind. He was the father of modern science-fiction. Novels like *The Time Machine* (1895), *The Invisible Man* (1897), *The War of the Worlds* (1898) and *The First Men in the Moon* (1901) have now become part of modern mythology. His gift for prophecy was as uncanny as that of Jules Verne (who might be called the grandfather of modern science-fiction). Years before they happened, Wells predicted the tank, war in the air, the atomic bomb, the problems of affluence and leisure, space-ships and inter-planetary travel.

For more than half his life Wells, the progressive socialist-humanitarian, was a firm believer in Utopia. Science and education would right the world's ills. Two world wars shattered his belief in the perfectibility of man. He died in 1946 just short of his eightieth birthday, and his last book, *Mind at the End of Its Tether*, foresaw a bleak future for the world. Yet he never lost sight of his belief in the novel as a vehicle of ideas, 'the initiator of knowledge, the seed of fruitful self-questioning'. In addition to his science-fiction he wrote novels rich in the comic spirit of Dickens like *Love and Mr Lewisham* (1900), *Kipps* (1905), *Tono-Bungay* (1909) and *The History of Mr Polly* (1910).

Arnold Bennett (1867–1931) with his picture of the 'Potteries' of Staffordshire, and John Galsworthy (1867–1933) with his portrayal of the gods of Property and Possession,

worshipped by the upper middle class in *The Forsyte Saga*, explored the social and economic issues of their day, though both suffered from cloudiness of vision: Bennett, because though a Socialist he became rather more concerned with his yacht and life in the fashionable hotels; Galsworthy, because his criticism of his capitalist hero Soames finally turns in the later novels to a sneaking regard. The televising of *The Forsyte Saga* in the sixties was ample proof that what is often thought of as the novel's greatest rival can in fact assist its popularity enormously.

The materialistic bias of Edwardian novelists provoked a reaction. On the one hand there was the basic response of D. H. Lawrence (1885 1930), the arch anti-materialist and opponent of civilization and the machine, who sought to exalt the natural instincts of man—especially sex—as the only real values in life. Whereas *Sons and Lovers*, published in 1913, records with deep passion the results of the hero's emotional attachment to his mother, *Lady Chatterley's Lover* (1928) is extravagant worship of the great god Phallus.

A more refined response to the Edwardian materialists came from Virginia Woolf (1882 1941), the High Priestess of Bloomsbury, so-called after the brilliant social-literary set that met in Bloomsbury before, during and after the First World War. Its members included Lytton Strachey, the scathing historical biographer of *Eminent Victorians* (1918), as well as E. M. Forster, and that incredibly versatile intellectual, the economist John Maynard Keynes.[1] Virginia Woolf believed the narrative novel was dying, and by exploiting the 'stream-of-consciousness' method certainly dealt a heavy blow to it in her own work. As with James Joyce, a far greater innovator, her novels pursue interesting avenues of experiment. But were they in the end culs-de-sac? Experiment can be pushed only so far; it fails when it becomes incomprehensible. And indeed, without a story how can the novel survive? The essential optimism of the Victorians was shown in their adventure stories, the 'rattling good yarns' which have their counterpart in modern-day

1. See page 70 ff.

authors like Alistair Maclean (b. 1922), and Nicholas Monsarrat (b. 1910) who have written so splendidly of the sea. Rider Haggard (1856–1925) and G. A. Henty reflected Britain's imperial glory then at its height. So with more subtlety and qualification did Rudyard Kipling (1865–1936), a superb craftsman in poetry and prose. His short stories like *Plain Tales from the Hills* (1888) brought home to the British, romantically and vividly, the colour of life in India, which still he saw as part of the White Man's Burden. In 1924 this attitude was rebutted in a mood of self-criticism in E. M. Forster's classic *A Passage to India*, which demonstrated the difficulty of communication between Indian and Briton.

With a growing mood of doubt about the Empire went a similar unease about the future offered by science, and perceptive authors well before Hiroshima saw science as a two-edged weapon. One such was Aldous Huxley (1894–1963) who might well have been a medical man if his appallingly bad sight had not prevented him from doing much of the necessary work. So he turned to the novel. His grandfather was the same Thomas Huxley who had taught Wells as a student. His brother Julian was a scientist and writer. Like Wells, Aldous Huxley used many of his novels as a vehicle for ideas. Unlike Wells, who was still basically an optimist when he wrote *The Shape of Things to Come* in 1933, Huxley saw very early on that science and technology could become a tyranny. His *Brave New World* (1932) is both satire and gloomy prophecy. Set in the era of Our Ford (celebrated by the sign of the T), it foresaw the mass-production of human babies in test-tubes and such contemporary controversies as 'genetic engineering'.

George Orwell (1903–50) put his emphasis on political tyranny. His novels determined a whole climate of post-war thought about the Cold War almost as decisively as did Winston Churchill's celebrated 'Iron Curtain' speech at Fulton, Missouri. *Animal Farm* (1945), where the animals take over a farm to run it for themselves in place of the tyrant humans, is a brilliant parable of the Russian (or

indeed any other) revolution, gone sour. The fine principles of the rosy dawn of revolt are one by one repudiated; notably the famous precept 'all animals are equal', later amended to 'but some are more equal than others'. In the end the pigs become as bad tyrants as the human masters.

Orwell, born of English parents in India, had begun as a rebellious Old Etonian campaigning against poverty and injustice (*Down and Out in Paris and London* (1933) and *The Road to Wigan Pier* (1937)) which he felt were the products of the capitalist-imperialist system. The brutality of the Communists which Orwell witnessed in the Spanish Civil War led him to doubt his left-wing allegiance. A Tory he never was; but he was too great a believer in individual freedom to stomach the Soviet regime; he clearly saw its horrors when criticism of the Soviet Union was not fashionable in left-wing circles. *Animal Farm* was conceived and written when pro-Russian war fervour was almost universal in Britain. In 1944 his publisher Victor Gollancz turned the book down and Orwell had trouble finding another publisher.

> You know what the difficulty is—Russia [Orwell was to write to Gollancz after the war was over]. For fifteen years I have regarded that regime with plain horror, and though, of course, I would change my opinion if I saw reason, I don't think my feelings are likely to change so long as the Communist Party remains in power. . . . I don't, God knows, want a war to break out, but if one were compelled to choose between Russia and America—and I suppose that is the choice one might have to make—I would always choose America.[2]

The full horrors of tyranny are portrayed in Orwell's *1984* (1949), written when he was already suffering badly from the tuberculosis which was to kill him. His TB contributed to the stark, nightmarish quality of the book. The terms

2. *The Collected Essays, Journalism and Letters of George Orwell.* Secker & Warburg, 1968; vol. IV, page 309.

which Orwell coined to describe the frightening techniques of brain-washing—newspeak and double-think are now part of everyday language. So too is the hated Big Brother. Behind every current outcry against encroachment on human freedom—whether they be moves to curb the press or the perils of electronic bugging and computerized data banks—lies the spectre of *1984*. Orwell's work is etched on the conscience of the twentieth century.

At first sight the pessimism of Orwell and the comic brilliance of Evelyn Waugh (1903–1966) have little in common. But both in their way were uttering warnings. Waugh against the decay of Christian values. There is much sudden brutality and violent death in Waugh's pre-war novels like *Decline and Fall* (1928) and *Vile Bodies* (1930) which were a sardonic send-up of the Bright Young Things of the Mayfair set. With a wealth of savage ridicule and random disaster, funny in its heartlessness, he satirizes without over moralizing.

As in Aldous Huxley's earlier satirical novels (*Antic Hay* (1923) and *Point Counter Point* (1928)) it is the naive and good who undeservedly come to grief while the poisonous and cold-blooded most often survive. Waugh's *Brideshead Revisited* (1945) is a more specifically Catholic novel, which regrets the passing of the gentleman and the elegance of a bygone era, a theme repeated in his greatest work the war trilogy *Sword of Honour*. In later years, when he lived in the West Country and brought up a large family, Waugh retreated still further into his High Tory Castle, a crusty old man with gout and ear-trumpet, viewing the outside world with disdain—even though some of this was simulated. When the Socialists came to power he declared that England was now an occupied country. Not that he had much time for the Tories either. 'The Conservative Party,' he once grumbled, 'have never put the clock back for a single second.'

On a winter cruise to the Far East he began to get hallucinations due to overdosing himself inadvertently with a sleeping draught containing bromide and chloral. Lying in his bunk he could hear strange voices condemning him as a

homosexual, swindler, dipsomaniac and literary fake. He was being persecuted, his enemies were in pursuit of him. . . . Mercifully he was able to get home without a total mental collapse. Most men would have buried this incident, but Waugh's sense of the ridiculous, much greater than his sense of pity, was so strong that he took the greatest delight in talking about 'the time I went off my head'. Not only that, he wrote up the entire episode in the autobiographical novel *The Ordeal of Gilbert Pinfold* (1957). Waugh could dissect himself as ruthlessly as he did his other characters. Pinfold, though a successful novelist, had become a bore: 'The part for which he cast himself was a combination of eccentric don and testy colonel and he acted it strenuously until it came to dominate his whole outward personality . . . he offered the world a front of pomposity.'

His visit to the Forest Lawn funeral glades in Los Angeles, which resulted in a biting satire on American burial customs, *The Loved One* (1948), is still all too well remembered at that expensive Hollywood cemetery ground. Happily the Waugh tradition lives on in the novels of Evelyn's son Auberon Waugh, who affects the same disdain for *hoi polloi* and deals in the same currency of sudden death. His *Who Are the Violets Now?* (1965) pokes fun at the woolly mindedness of earnest do-gooders and others on the loony liberal fringe. In *Consider the Lilies* (1968) Waugh turns his satire on the Church of England and its tolerance of eccentric priests.

It is no surprise that the man widely regarded as England's greatest living novelist should also be a Roman Catholic convert. The heart of any good novel is conflict, and in all his writing Graham Greene (b. 1904) is acutely aware of the conflict between good and evil and this world and the next. God is another character, an extra dimension in his novels. Yet Greene is also a highly topical writer with an uncanny nose for trouble-spots in the making. *The Quiet American* (1955) is set in war-torn Vietnam before the Americans got there. *A Burnt-Out Case* (1961) is about a leper colony in the Congo before the Belgian hand-over. *Our Man in Hav-*

ana (1958) is set in Cuba at the time of the first rumbles of the Castro uprising. *The Comedians* (1966) takes place in the Caribbean dictatorship of 'Papa Doc' Duvalier's Haiti, 'an evil slum floating a few miles from Florida', where every deed is observed by the secret police.

'My enemies might say I get my ideas from theological works and newspapers,' Greene once said. This mixture of moral debate and topicality, combined with his ability to write a very taut thriller, has made Greene something of a rarity. He is a best-seller (60,000 copies a time in hard-cover for a new novel in Britain) who is also regarded as a 'serious' writer in high-brow critical circles. This also goes for what he calls his 'entertainments'—the lighter thriller novels such as *Stamboul Train* (1932), *A Gun for Sale* (1936), *The Confidential Agent* (1939) and his film *The Third Man* (1950).

Greene, son of a Berkhamsted headmaster whose school he also attended, is distantly related to Robert Louis Stevenson. His younger brother, Hugh Carleton Greene, was the Director-General of the BBC. As might be gathered from the atmosphere of seediness, despair and failure that pervades his novels, Graham Greene confesses to the besetting sicknesses of boredom and depression. As a young man he contemplated suicide and even on several occasions played Russian roulette. Fortunately this gamble with death lost its kicks before Greene could terminate a promising career by blowing his head off. A convert to Roman Catholicism at the age of twenty-two he was a sub-editor on *The Times* before becoming a novelist, and it took him ten years to establish himself as a writer of note. *Brighton Rock* (1938) his picture of the hellish underworld of Brighton, made his name. After a visit to Mexico in the same year to study the persecution of Catholics there he wrote what is probably his finest novel, *The Power and the Glory* (1940), the story of a 'whiskey' priest who risks his soul to save others.

Greene's obsession with evil and his feeling of community with the sinner are themes repeated in his African novel *The Heart of the Matter* (1948), in which Scobie, a British police officer (Catholic, of course), would rather commit the

sin of adultery and make a sacrilegious Communion, than abandon a young widow, shipwrecked in the war, who needs his help. In *The End of the Affair* (1951) the heroine is an adulteress who dies unrepentant, but who proves after her death to have had almost saintly powers of healing. Greene seems to believe, as George Orwell once said, 'that there is something rather *distingué* in being damned: Hell is a sort of high-class night-club, entry to which is reserved for Catholics only, since the others, the non-Catholics, are too ignorant to be held guilty'.

Greene has never lacked compassion for fellow writers. One beneficiary was the Scots-born Catholic novelist Muriel Spark. She was determined to make her living solely by writing, but her income in the early days was so pitifully small—less than £3 a week—that she fell seriously ill because of malnutrition. 'Of course, it was my own fault,' she recalls. 'I could have gone back to typing. But I wouldn't.' Greene gave her money to tide her over and she lived in the guest-house of a Carmelite monastery at a nominal rent. Mrs Spark is not guilt- and doom-obsessed like Greene: she has more in common with Evelyn Waugh, especially in her use of random disaster, which typically visits those worthy characters who least deserve it. In *The Ballad of Peckham Rye* (1960) a satanic young man causes havoc among the workers' lives in a South London factory. *Memento Mori* (1959) tells of a group of old people haunted by mysterious telephone calls. At her best Muriel Spark is one of the greatest mistresses of cool wit since Nancy Mitford wrote *The Pursuit of Love* (1945) and *Love in a Cold Climate* (1949) soon after the war.

Mrs Spark's marriage broke up early. 'I've been unlucky in love. I've known considerable loneliness. I think it's a major problem in our society, which is why I've written about it.' Her first novel, *The Comforters* (1957), was about middle-class English people made odd by loneliness. 'But,' she says, 'I've made many friends with my books.' Her novel, *The Prime of Miss Jean Brodie* (1961), story of an unorthodox Edinburgh schoolmistress, became a successful play

and film. Muriel Spark is part Jewish, and her most sizeable work, if not her most brilliant, is *The Mandelbaum Gate* (1965). Set in the then divided city of Jerusalem, it explores the problems and tensions of a girl who is half Jewish and a Catholic convert.

Angus Wilson is another master of the waspish short story and sardonic novel, though, unlike Waugh or Spark, he writes specifically from an agnostic, humanist standpoint. In stories like *Such Darling Dodos* (1950) and the novels *Hemlock and After* (1952), *Anglo-Saxon Attitudes* (1956) and *Late Call* (1964) he has prised the lid off the British social scene. His gallery of frauds, hypocrites, opportunists, queers and bores is exposed with a deadly ear for contemporary dialogue and a hawk-like eye for social pretensions.

Born in 1913, he wrote his first book at thirty-six when he was deputy superintendent of the British Museum Reading Room. Six years later he gave the job up—pension rights and all—to become a full-time writer. He retreated to a converted woodcutter's cottage deep in the heart of wooded rural Suffolk, where the loudest noise is the cooing of a dove. 'Most writers start in the provinces and go to live in London For me it was the other way round.' He now has his roots in East Anglia, lectures as Professor of English Literature at the university there, but enjoys his solitude while working. He's been called 'the nicest nasty writer to appear since the war', but a certain mellowness crept into his longest, most ambitious novel, *No Laughing Matter* (1967) It is a family chronicle in the Galsworthy mould, but much more wry in approach and with almost enough characters and sub-plots to satisfy Dickens, of whom he has written an admiring biography.

There is a lot of autobiography in *No Laughing Matter*. Poppa Matthews, who sires six lively children, is a rather futile writer who has never published a book of moment, but lives, indeed sponges, off the inherited wealth of his family. The children are brought up in a Bohemian, not very respectable, atmosphere. Wilson reminisces: 'My own father was a barrister, delightful rogue, keen on sport, but never

actually handled a case. His inherited money rapidly dwindled since his principal sports were racing and gambling. One of his favourite remarks was that when he got to Heaven God would say to him: "Billy Wilson, you weren't much good on earth. But you were always a damn good sportsman." '

Again like the Matthews children Angus Wilson was one of six and, like the maliciously tongued Marcus Matthews in the novel, he was the last of the six by a good few years. 'I was really a sort of afterthought. My parents were separated and then came together again. I suppose I was the celebration.' The title of his novel is significant: 'The ability to laugh at ourselves is supposed to be a national virtue. I'm not so sure. We spend too much time laughing. I should like to see us take some positive steps after the laughter. We might even, for instance, start praising ourselves for our genuine achievements.'

The fifties was said to be the age of the Angry Young Men, and Angus Wilson's name was sometimes included in the number, which was flattering to his age; but his cool fiction had little in common with the belly-rumble of anger and class envy which motivated the novels of Kingley Amis (b. 1922), John Wain (b. 1925), and John Braine (b. 1922). In the theatre Jimmy Porter echoed the same feelings in John Osborne's *Look Back in Anger* (1956). Predictably Evelyn Waugh found the 'Braine, Wain, Amis school' of writing (he always pronounced Amis as Ames) anathema to him. 'These poor creatures grew up in humble circumstances and never heard educated people talking. . . . When, at the universities they got to, they did for the time being hear educated people, they were affronted. In their novels they jeer at them as prigs and hypocrites.'

But it was not education, rather academic humbug and phoney culture that Kingsley Amis assaulted in his splendid knockabout comedy *Lucky Jim* (1954)—where the irreverent junior lecturer Jim Dixon spends much of his time shocking his potty professor, drinking too much and cordially loathing the professor's cultural week-ends. Jim is fond of the

birds, especially the girl who might be thought to be above his station. He gets her too, and the fact that she properly belongs to the son of the professor makes his victory all the sweeter.

Joe Lampton, in John Braine's *Room at the Top* (1957), is another lower middle-class lad casting covetous eyes at the boss's daughter. When he eventually puts her in the family way, so that they have to marry, his feeling of triumph has as much to do with having acquired a status symbol as it has to do with love and lust. He has penetrated the despised middle classes at their most vulnerable point—both physically and metaphorically. He has proved himself as good as they are. Joe is obsessed with the trappings of affluence—smart car, monogrammed cigarettes and the like. In the sequel *Life at the Top* (1962) he has achieved nearly all of them, but is now bitter at the thought of having contracted a loveless, unfaithful marriage as the price. Whereas Lampton's motto is 'if you can't beat 'em, join 'em', the anti-hero of John Wain's *Hurry On Down* (1953) starts in the middle class and expresses his protest by moving down the social scale.

Braine, Yorkshire, stolid on the surface but emotional underneath, started as a £12-a-week librarian in the West Riding, a prolific spawning-ground for contemporary novelists of provincial working-class life like Stan Barstow (*A Kind of Loving* (1960)) and Keith Waterhouse (*Billy Liar* (1959)). Thanks in part to authors like these class stratification is no longer the all-pervasive and dominant force in British society. Assimilation is always at work. Braine himself has torn up his Labour Party card, disowned his allegiance to Socialism and moved south from his native Yorkshire to a seven-bedroomed, two-garage house in the stockbroker belt of Surrey. He does not see the process as selling out. What changed him was a visit to the United States. 'Over there everybody has a chance to change himself by his own efforts, and nobody resents it if you make yourself successful. The system can be brutal, but it's a bloody sight better than Socialism or Communism, where you're

condemned to live in a groove ordained by the State.' Kingsley Amis, too, has moved from Left to Right, and both he and Braine have been denounced by *Pravda*. Amis has championed with scholarly analysis such supposedly lower art-forms as science-fiction and jazz. He is a highly versatile novelist, ranging from comedy as in *One Fat Englishman* (1963), in which deflation and anti-climax are the strongest points, to novels with a Greene-like theme such as *The Anti-Death League* (1966) which centres on a secret weapons training unit in Britain in which the big debate is about the infliction of death in large quantities. There followed a ghost story, sex comedy, *The Green Man* (1969).

More earnest in tone is Alan Sillitoe (b. 1928), a former Nottingham factory worker whose first novel, *Saturday Night and Sunday Morning* (1958), was turned down by five publishers before being accepted by W. H. Allen. Subsequently, aided no doubt by the film of the book which also established Albert Finney as an actor, it has sold over a million copies. It is a working-class novel in the D. H. Lawrence mould, set in the tough Nottingham mining area where both he and Sillitoe were raised. The hero Alan Seaton is a factory hand who obtained his earthly bread (women and beer), but not his spiritual bread. Although he realizes this he is too inarticulate to do anything about it. *The Loneliness of the Long Distance Runner* (1959), about a rebellious boy at an approved school, was another successful film, which established Tom Courtenay as a star. The theme of spiritual hunger, the yearning for something which lies over and beyond the material trappings of everyday humdrum existence, is present in all of Sillitoe's subsequent novels such as *The Death of William Posters* (1965) and *A Tree on Fire* (1967), which recount the adventures of Frank Dawley, a Nottingham factory worker who leaves his wife and runs away from home, questing for he knows not quite what.

Unlike Sillitoe, John Fowles is not in love with the inarticulate hero. This former school teacher had eight false starts at various novels before *The Collector* became his first published work in 1963 when he was thirty-seven years old. It

sold in millions and was also filmed. The story based on a real-life incident has a macabre authenticity. A poorly educated, sexually inhibited boy, Frederick Clegg, becomes obsessed with a beautiful and cultural art student, Miranda, whom he kidnaps and imprisons in an escape-proof cellar, where she wilts and finally dies. The perfect horror story, but it illustrates too the conflict between *hoi polloi*, the mindless many in Society, and the élite.

The Collector was a clear-cut narrative. Fowles's two subsequent novels, *The Magus* (1966), a fantasy set on a Greek island, and *The French Lieutenant's Woman* (1969), about a wronged Victorian governess, have experimented with time and structure. He sees the 'bi-focal' vision of *The French Lieutenant's Woman* -the flashing back and forth between past and present—as a promising new way of writing historical novels. 'You have the past and you can also say something interesting about it from today's stand-point.'

Reflecting the discontents of society is an inevitable part of the modern novel, and one half of the world's population has long felt itself to be suffering from inequality—the women. Certainly the British novel has done the sex-war proud. Perhaps the most glamorous and striking exponent of the art is Edna O'Brien (b. 1932). She concedes that women may have found new freedoms, both political and sexual, thanks to the vote and the Pill, but she is still angered by women's subservient biological role. 'Men are bound to be freer. They carry the seeds of children, but women carry the children. Having the vote can't change that,' she says. Irish born, but now living in London with two teenage boys—she has parted from her husband—Miss O'Brien's early life was shaped by a strict Catholic upbringing from which she soon rebelled. This is reflected in her trilogy of novels *The Country Girls* (1960), *The Lonely Girl* (1962) (filmed as *The Girl With Green Eyes*) and *Girls in Their Married Bliss* (1964), in which two Irish girls, Baba and Kate, come out of isolated convent life, vulnerable and seeking an almost impossible romantic love. They are used by a variety of men, and inevitably, when they finally marry, it is a bitter unfulfilled busi-

ness Miss O'Brien was married at nineteen herself and feels she was unprepared. *Girls in Their Married Bliss* reflects a complete disillusion with marriage and men, who are regarded as a despised necessity. 'I believe the most honourable and fruitful form of novel-writing is to go as near the bone—the marrow of the bone—as possible,' says Miss O'Brien, and this she certainly does in *August is a Wicked Month* (1965), where the heroine's search for sexual fulfilment through a variety of frantic affairs ends in the final barren reward of a dose of venereal disease.

Miss O'Brien's is the dilemma of modern womanhood—the simultaneous and irreconcilable desire to dominate and to be dominated. A similar anti-male resentment is the theme of the South African-born novelist Doris Lessing's *The Golden Notebook* (1962). The leading girl guerrilla in the sex-war is probably the formidable Brigid Brophy who has sought to demonstrate in novels such as *Flesh* (1962) and particularly *The Snow Ball* (1964) that women can use men. After all, a man's sexual performance is limited over any given period of time, but a woman can accommodate and pleasure many lovers. 'There is no reason why women shouldn't have three or four lovers if they wish,' says Miss Brophy.

Less stridently feminist and reflecting more a confused attitude to the frustrations of marriage are Penelope Mortimer and Margaret Drabble. In her novels *The Pumpkin Eater* (1967) and *My Friend Says It's Bullet-Proof* (1969), Mrs Mortimer, wife of the playwright John Mortimer, shows woman as uncertain of her new and more equal role; she remains a somewhat vulnerable creature, a masochist—with an inbuilt 'do-it-yourself-hurt-kit'. Margaret Drabble, a sister of another successful writer, A. S. Byatt, is a Cambridge double first and was a Shakesperian actress till she married and had children. Her novel *The Millstone* (1966) is the story of an unmarried mother. In *The Waterfall* (1969) she explores the dangerous apathy and inactivity into which a passive marriage can sink. She is the spokeswoman for the

Captive Wife and more recently the accomplished biographer of Arnold Bennett.

Like a breath of cool, fresh air, after the torrid atmosphere of the sex-war are the women novelists whose primary aim is the enjoyment of the reader Daphne du Maurier is a natural story-teller whose most famous novel *Rebecca* (1938) has gone through forty editions and been made into a highly successful film. Daughter of the actor-manager Sir Gerald du Maurier, she lived for twenty-five years at Menabilly, the Queen Anne house in Cornwall which was the Manderley of *Rebecca*. This story of the shy, inexperienced little second wife, who follows the much-praised dead wife and is persecuted by the spiteful housekeepr, has a haunting quality right from the opening sentence: 'Last night I dreamt I went to Manderley again'—a twelve-syllable line or Alexandrine which can be scanned as verse. Like most good story-tellers Miss du Maurier has had many film successes, notably *Jamaica Inn* (1936), *Frenchman's Creek* (1944) and the Hitchcock horror *The Birds*, in which humans are suddenly attacked by swarms of viciously pecking birds.

Another best-selling historical and romance writer on both sides of the Atlantic is Victoria Holt, herself a romantic mystery story. In real life she is a widow in her fifties called Eleanor Hibbert. Her flat under the shadow of the Albert Hall is a one-woman book factory. For Mrs Hibbert has written historical novels under no fewer than seventeen different pseudonyms, of which the best known in Britain is Jean Plaidy. But in America—witness her bestseller *The Shivering Sands* (1969)—she is famous as Victoria Holt and is big time indeed, earning up to £100,000 a book. In fact it was this seventeenth pseudonym that brought about a startling change in her fortunes. 'The Plaidy books sold well, but none was actually a best-seller. It seemed I was too well-known and predictable. Then my American publishers got the idea of making me into a mystery woman called Holt. When people asked "Who is she?" they wouldn't say.' When the 'new' mystery authoress caught on her identity was finally revealed. Since then she has not looked back. 'My

books are pure entertainment. They say, "Come and sit down; have a good time. It's a marvellous story."' In comparison Georgette Heyer's lengthy sequence of Georgian novels strike a repetitive note—but she was an automatic best-seller with every new book. On a deeper level of storytelling are the historical novelist Mary Renault, with her fascinating treatment of Greek history and myth (*The King Must Die* (1958) and *The Bull from the Sea* (1962), and Rumer Godden, who started by catching the atmosphere of life in India before independence (*Black Narcissus* (1938)), and has lately achieved great success with her novel of life and healing in an enclosed order of nuns, *In this House of Brede* (1969).

Iris Murdoch (b. 1919) is a tweedy, very British-looking lady, an Oxford philosophy don before she took up writing full time. Her novels have been likened to 'sexual square dances'. She is adept at presenting complicated love tangles. 'I usually start with a tiny germ of a situation involving two or three people and their relationship together, and then everything winds itself round this.' Incest, homosexuality - every possible permutation of who does what and to which and to whom has been tried by Miss Murdoch in novels like *A Severed Head* (1961) (also a successful stage play), *An Unofficial Rose* (1962) and *The Italian Girl* (1964). However, her sex is seldom of the explicit kind. Despite the intricate games of extra-marital musical chairs and first-time coupling, this is sex on an intellectual plane which has little to do with the area between the navel and the knes. In her liking for the weird, close-knit family situation riddled with sexual innuendo Iris Murdoch has a lot in common with the late Ivy Compton-Burnett. For many Iris Murdoch's best novels are her early ones such as *The Bell* (1958), set in an Anglican lay community, and *The Sandcastle* (1957), where a middle-aged schoolmaster, hemmed in by a possessive wife, turns to the love of a young girl painter. The affair fails because the schoolmaster is too much the prisoner of convention.

Pamela Hansford Johnson, whose husband is novelist Lord (C. P.) Snow, wrote her first novel, *This Bed Thy Centre,*

in 1935 at only twenty-two. A youthful girl friend of Dylan Thomas and no mean poet herself, she has written of serious human dilemmas, like that of the physician in *An Error of Judgment* (1962), who realizes that he took up medicine because of his fascination with pain. *The Unspeakable Skipton* (1959) is black comedy about a mad novelist engaged on a book that will never be finished. In it Miss Johnson takes a shrewd tilt at literary pseudo-intellectuals, and in *Cork Street, Next to the Hatters* (1965) she spoofs the absurdity of much avant-garde theatre.

Her husband, Charles Percy Snow (b. 1905), has the stolid virtues of the Victorian novelist and has often been likened to Trollope. The central character in his *Strangers and Brothers* (1940) series of novels is Lewis Eliot, a high-powered civil servant. Like Snow, the son of a Leicester factory clerk, Eliot comes from a lower middle-class family in the Midlands, and makes his way through the professional world on sheer ability. The eleven novels in the series, written over a period of thirty years and covering almost half a century of the English social and political scene, reflect much of Snow's own life.

In *The Masters* (1951), which deals with the election of a new Master of the college, and *The Affair* (1960), about a case of alleged scientific fraud, Snow is writing about the world of closed politics in a university which he came to know so well as a Fellow of Christ's College, Cambridge. Snow invented the notion of the Two Cultures, the growing gap between science and the arts. In *The New Men* (1954) Snow probes the moral dilemma of a group of British scientists, including Eliot's own brother, who are researching into nuclear fission during the war. The concept of power and the process of decision-making fascinate Snow, and in *Corridors of Power* (1954) he moved from closed politics to high politics. Snow is often at his best when Lewis Eliot is directly involved in the story rather than an observer-narrator. In *Homecomings* (1956) he gives us a memorable and harrowing portrait of a strained and neurotic woman, Eliot's first wife Sheila, who finally commits suicide.

Two more memorable, though very different, British novelists have chosen to chronicle their own vision of the twentieth century through a series of novels. In his *A Dance to the Music of Time* sequence (1951) Anthony Powell (b. 1905), son of a regular soldier and at Eton with George Orwell, covers pre-war Oxbridge and country-house party days and then the war through the eyes of his narrator Nick Jenkins. Henry Williamson, besides being well known for his nature books like *Tarka the Otter* (1927) and *Salar the Salmon* (1935), is a wonderful observer of nature and the countryside; but running through his fifteen-volume saga, *A Chronicle of Ancient Sunlight* (1951 69), are much harsher and more disturbing themes as well. The 'Chronicle' records through one man, Phillip Maddison, and his family sixty fraught years of British history, from childhood in a Victorian suburb to the decline of Europe because of two bloody and fratricidal wars. Williamson is the Phillip of the novels. He served in the trenches in the First World War, where the slaughter left a permanent scar on him which is reflected in the novels.

Olivia Manning's important Balkan trilogy *The Great Fortune* (1960), *The Spoilt City* (1962) and *Friends and Heroes* (1965) traces through the lives of two English people, Harriet and Guy Pringle, working in Rumania the impact of the Second World War on Balkan civilization.

Laurence Durrell (b. 1912) made a great name for himself with his unusual *Alexandria Quartet* (1956–60), four spicy novels about love and sun in the Mediterranean, in which each volume tells basically the same story but from the viewpoint of a different character. Durrell writes his novels with gusto and dazzling verbal brilliance. He was once in the Foreign Office, but in the fifties he splurged his last £400 on a cottage in Provence. Running short of money he wrote the Quartet in an eight-month burst of creativity. He is a romantic at heart—'I'm an anachronism. I take love seriously. One should always be in love'—but a somewhat disillusioned one when it comes to the state of the world. He sees scientific values superseding human values, with the hydra-headed

monster of technology threatening to swallow up human freedom. His later novels, *Tunc* (1968) and *Nunquam* (1970), deal with an international industrial leviathan known as 'The Firm' whose tentacles spread everywhere till it becomes a sort of universal father-mother figure monopolizing the life of all its employees. The novels' odd titles derive from the Latin tag *aut tunc aut nunquam*, meaning 'either now or never'. In other words, now is the time when mankind finds itself at the crucial point of decision.

The conflict between the demands of the group and the rights of the individual is a recurring theme in the work of Leslie Poles Hartley (1895–1972). He explores it in *The Boat* (1950) and in *Facial Justice* (1960), in which England after World War III attempts to recover by removing the competitive spirit and imposing a drab uniformity on all its citizens. Hartley's greatest achievement is his *Eustace and Hilda* trilogy, in which Eustace, a delicate little boy, is devoured emotionally by the sister he worships. The theme is symbolized in the first book of the trilogy, *The Shrimp and the Anemone* (1944), where, as a young boy, Eustace looks into a pond and sees an anemone gradually sucking up a shrimp. Hartley often uses a child as the central character, most notably in *The Brickfield* (1964) and *The Go-Between* (1953), in which thirteen-year-old Leo acts as messenger between his cousin Marian and her lover Ted. The affair ends in tragedy when Leo finds the couple in the act of making love.

Few storytellers have given more pleasure than John Boynton Priestley. When he celebrated his seventy-fifth birthday in 1969 he had written about a hundred novels, plays and books of essays, of which the most famous are the inter-war novels: *The Good Companions* is a colourful chronicle of the adventures of a concert party in the late 1920s. *Angel Pavement* (1930) is a superbly evocative story of how little people battled against the insecurities of the Depression and the villainies of crooked financiers. This is Priestley in his 'Jolly Jack' mood, exuding a sentimental glow about the essential goodness of ordinary people. A frequent theme in his writings is the phenomenon of Admass

(his own word), meaning the commercial brainwashing, as he sees it, of modern capitalist society and the treating of man at his lowest level—as a consuming animal.

In more recent years Priestley has been more acclaimed by the reading public than the critics. No disgrace in this. It even happened to Somerset Maugham (1874–1965) among whose enormous output are novels that stand comparison with any written in the twentieth century; *Of Human Bondage* (1915) is based on his own unhappy childhood when, orphaned at ten, he went to live with his unsympathetic uncle, the vicar of Whitstable. Philip Carey in the novel suffers from a club-foot; Maugham's trouble was the stammer that plagued him throughout life and made his schooldays a misery. The rich character of Rosie the barmaid, warm-hearted and promiscuous in *Cakes and Ale* (1930), is one of the most memorable in fiction. 'She was naturally affectionate. When she liked anyone it was natural for her to go to bed with him. . . . It wasn't lasciviousness, it was her nature.' There speaks the voice of Maugham, worldly wise, often cynical, the unshockable observer of the human comedy. Maugham's first novel *Liza of Lambeth*, a study of Cockney life in the slums based on his own experience as a doctor, appeared in 1897, the last more than half a century later. 'The novel, I can never repeat too often, is not to be looked upon as a medium of instruction or edification, but as a source of intelligent diversion,' wrote Maugham. Many of his short stories, such as 'Rain', the tale of the repressed missionary and the prostitute Sadie Thompson, have become as famous as his novels. In this difficult literary form he was the model and the master Maugham believed in the spare, unadorned style, and his sheer story-telling ability was unsurpassed. He had, too, an easy command of exotic settings, a quality also to be found in the work of his nephew Robin Maugham in such novels as *The Green Shade* (1966) and *The Link* (1969). Robin Maugham's novel (1948) and play (1963), *The Servant*, has been rightly hailed as a masterpiece, and he has written perceptive studies of his Uncle 'Willie'. Somerset Maugham feared and hated poverty. 'Money is

a sixth sense without which you cannot make the most of the other five.' He died immensely wealthy, but 'Willie' was not a happy man. 'Mer-my greatest mistake was this,' he once stammered to Robin, 'I tried to persuade myself that I was three-quarters normal and only a quarter of me was queer—whereas really it was the other way round.'[3]

Another prolific novelist covering an immense span of years is Sir Compton Mackenzie (1883–1972). *The Passionate Elopement* came out in 1911. *Sinister Street* (1913–14) is a vivid picture of the pre-war undergraduate generation. Sir Compton has written of Lesbianism in *Extraordinary Women* (1928) when the theme was more than daring. He has written of homosexuality and its threat to the life and career of a professional man in *Thin Ice* (1956). He has also created some fine Highland comedies, notably *Whisky Galore* (1947), the story of a war-time shipwreck of Scotch whisky. Latterly, following a stormy career in which he has run foul of many kinds of officialdom, including the Official Secrets Act (for writing unpompously and revealingly about his First World War Intelligence experiences), Sir Compton published a ten-volume autobiography, each one representing eight years of his life from birth to the age of eighty. Blessed as he was with total recall, he could even remember himself as a child in a pram at a few months old. At eighty-eight he had lost none of his sprightly humour. Sitting in his four-poster bed during a morning rest, puffing a cigar, he declared: 'When you get past a certain age and achieve any sort of distinction, you become venerated like an ancient monument. People drop by to see you as if you were Stonehenge.' Mackenzie seemed almost as indestructible.

Some authors remain impervious to melancholy no matter what travails the world is passing through. Pelham Grenville Wodehouse, born in Guildford in 1881 and son of a Hong Kong judge, is one of these. His schooldays at Dulwich 'went like a breeze'. After a brief and frivolous career as a ledger clerk in the London office of the Hong Kong and Shanghai

3. Robin Maugham, *Somerset and All the Maughams*. Heinemann, 1966.

Bank, he embarked on a writing career in which he has tootled gaily and irreverently through some ninety books since the turn of the century. 'There has been one for every year of my life.' The first was a school story, *The Pothunters*, in 1902, and it was in a school story that the immortal Psmith first appeared. Gentleman's gentleman Jeeves made his debut in 1916 in a short story in the *Saturday Evening Post* with the none too memorable words: 'Mrs Gregson to see you, sir,' followed by: 'Very good sir, which suit will you wear?' He and Bertie Wooster have travelled a long way since then, from the pre-prohibition era to the modern world of television and the Welfare State. But they remain ageless. Malcolm Muggeridge brackets them with Don Quixote and Sancho Panza as one of Western literature's greatest comic double acts. Impeccable Jeeves is always at hand to rescue Wooster, who is more than an endearing ass; he is the supreme bungler, who gives us all a feeling of superiority. But the real genius of Wodehouse is his mastery of language—especially the piquant metaphor and simile. 'The magistrate looked like an owl with a dash of weasel blood in him.' 'The smile vanished off his face like breath off a razorblade.' 'A conscience as tender as a sunburned neck.' 'Unseen, in the background, Fate was quietly slipping the lead into the boxing glove.' 'The Duke's moustache was rising and falling like seaweed on an ebb tide.'

In his thirties Wodehouse had gone to live in New York, and being rather short of money he decided to sell a farce on the English aristocracy to the American magazines. This was the start of Lord Emsworth of Blandings Castle, the barmy peer with the inane passion for prize pigs. Inevitably too there was a butler, the somewhat peevish Beech. Wodehouse last set foot in England before the war—to see a cricket match. He now lives in Long Island and has not cared to return to the land of his birth. It could be that he still feels self-conscious about the row in Britain over some naïve broadcasts he made for the German radio when he was interned there during the war. The broadcasts were innocent enough, but the mere fact of his making them at all was in-

vidious. His verdict on the episode a quarter of a century later was good public-school, stiff-upper-lip, but with no side at all. 'I made an ass of myself and had to pay for it.' Entirely from his own choice Wodehouse has cultivated a narrow field, but has done so to perfection. He has had too an accomplished career as song-writer and lyricist.

Perhaps because they are a law-abiding race the British have always found crime peculiarly fascinating, and it is remarkable how much women have contributed to the crime novel. As Alfred Hitchcock once said: 'England is the only country where sedate ladies make fortunes from writing thrillers.' The list is a formidable one—Dorothy Sayers, Joan Fleming, Mary Kelly, Helen MacInnes, Mary Stewart among others, and the queen of them all Agatha Christie, who next to Shakespeare is the most widely translated British author (Enid Blyton comes third). Mrs Christie's lengthy and incredible career began in 1915 at the age of twenty-five, when her sister issued a casual challenge: 'I bet you couldn't write a detective story.'

Her background equipment for the task was good. She had been steeped in Conan Doyle and encouraged by her mother to write. Now, in the middle of the war, she went to work for the Red Cross in a hospital dispensary in Torquay Those brightly coloured bottles of 'monkshood blue and the deadly cyanide' fired her imagination. 'Here is menace and murder and sudden death in these phials of green and blue,' she was to write. Her famous detective, Hercule Poirot, was based on a Belgian refugee who was billeted near Torquay. Her first novel, *The Mysterious Affair at Styles*, went the rounds of six publishers before it appeared in 1920. It was an immediate success. Miss Jane Marple seems to have been based loosely on Agatha Christie's own grandmother, whom she described as 'a pink and white old lady who, although having the most sheltered and Victorian of lives, nevertheless always appeared to be intimately acquainted with the depths of human depravity'.

If Mrs Christie has a fault it is in the over-use of the 'least likely motive' person as the true culprit. In *The Murder of*

Roger Ackroyd the trick-ending reveals the narrator as the murderer. The ethics of this were earnestly debated at the time – and still are. Crime, even between hard-covers, is no laughing matter. Curiously it was the criticism provoked by *Roger Ackroyd*, coupled with the death of her mother and the impending break-up of her marriage to Colonel Christie (ex-Royal Flying Corps), that caused Mrs Christie's attack of amnesia and much publicized disappearance in 1926. She has always claimed a genuine loss of memory and much resented imputations that her disappearance was a publicity stunt. She was finally discovered in a Yorkshire hotel registered under the name of her husband's future wife. In 1930, following her divorce, she became the wife of the archaeologist Professor Max Mallowan (later Sir Max), and novels with the background of the archaeological 'dig' – *Death on the Nile*, *Murder in Mesopotamia* – soon followed.

For fifty years she has produced for her publishers Collins a novel a year, the famous Christie for Christmas. 'A sausage machine, a perfect sausage machine,' she once called herself. On her eightieth birthday she told us: 'I'm dreadfully unobservant, not like a good descriptive writer ought to be. I know nothing about pistols and revolvers, which is why I usually kill my characters off with a blunt instrument – or better still poisons. Poisons are neat, clean and really exciting.'

The 'donnish' school of detective writing is a typically British phenomenon, with novelists like Michael Innes (pen name of the Oxford don John Innes Mackintosh Stewart) creator of Inspector Appleby The late Poet Laureate Cecil Day-Lewis wrote thrillers under the pseudonym Nicholas Blake. Even as the official poet of the nation (annual fee £70 plus £27 in lieu of a butt of sack) Day-Lewis had to face the fact that murder is more profitable than poetry. He wrote his first novel as a young schoolmaster at Cheltenham A leaking roof and a repair bill of £100 was the spur, though the novel's theme of an assistant master's love for the head's wife was considered inappropriate and nearly got him the sack. Soon, however, 'Nicholas Blake' was earning enough for him to

give up schoolmastering and in the thirties he also became a firebrand poet of the Left. For a while he was an outright Communist, but quit the party in 1939 on the justified if quixotic grounds that its dogma led him to write bad verse. He rocognizes the hazards of the crime *genre*: 'It is discouraging to find a character, whom you believe you have furnished with flesh and blood, leaking nothing but sawdust when he is stabbed.' But he justly concludes: 'The thriller is a form of escape more stimulating for some of us than bingo and less harmful than heroin.'

Most prolific detective writer of them all was John Creasey, who for forty years, till his death in 1973, had an unparchable pen. Under various aliases wrote almost 600 books including the Inspector West, Gideon of the Yard and Toff series—total wordage of more than 40 million.

In the late fifties and sixties the spy novel gave signs of ousting the detective novel. The tide has receded slightly now, but it was a powerful movement in popular literature and it started in Britain. Just as Sherlock Holmes is the most famous detective in fiction, so James Bond is the world's most celebrated agent. He has sold over 80 million copies in thirty-two languages—an astounding achievement for his creator Ian Fleming (1908–1964), who did not write the first Bond book *Casino Royale* until he was forty-three. Fleming, son of a Tory MP killed in the First World War, came from a famous merchant banking family at which sedate occupation he spent seven none too enjoyable years before joining Reuters as a foreign corroespondent. In the war he joined the office of the Director of Naval Intelligence as an ideas man. On a mission to Washington he helped General 'Wild Bill' Donovan to set up America's Office of Strategic Services, which later grew into the massive CIA. It was his war work which gave him the background for James Bond a name borrowed (without permission) from the real-life American ornithologist James Bond, whose book *Birds of the West Indies* was one of Fleming's bibles during his stays at his house in Goldeneye, Jamaica. 'It was a properly anonymous name for my hero,' explained Fleming, who at first saw

Bond as a man to whom extraordinary things happened but with no great personality of his own.

Fleming started very modestly. *Casino Royale*, published in 1953, earned only £218 19*s.* 7*d.* in royalties. He had just married Lord Rothermere's ex-wife Anne after a lifetime's bachelorhood, and commented ruefully: 'That'll barely keep Annie in asparagus.' By the fifth novel Fleming had still not hit the jackpot and he decided to kill Bond off. One man saved 007 and that was Raymond Chandler, the American thriller-writer, whose encouragement decided Fleming to continue. His first big break came when the Prime Minister, Sir Anthony Eden, whose health had collapsed at the time of the Suez crisis, went to Goldeneye to recuperate in late 1956. Fleming's name appeared prominently in the press, and the *Daily Express* bought serial rights in *From Russia, With Love* (1957). By this time Bond had acquired a definite personality as well as a few memorable idiosyncrasies, like the martini shaken, not stirred. Critics often stylized the three ingredients of a Bond novel as sex, snobbery and sadism. To this a resentful Fleming replied: 'Sex enters all interesting books and lives. As to snobbery, wouldn't all of us like to eat better, stay in better hotels, drive faster motorcars. As for sadism — frankly the old-fashioned way of beating spies with baseball bats and truncheons became obsolete during the last war.'[4]

Though Fleming always disclaimed any connection with 'that cardboard booby' Bond, his biographer John Pearson[5] believes that the novels were Fleming's undercover autobiography. Certainly he and Bond had a good deal in common. Fleming, with his wry smile and classic good looks, given an extra dash of toughness by a flattened nose (result of a football collision at Eton), was apparently irresistible to women. Both Bond and Fleming had left Eton in a hurry due to a spot of girl trouble; both golfed, spied, gambled, loved luxury and smoked monogrammed cigarettes to ex-

4 Roy Newquist (ed), *Counterpoint.* Allen & Unwin, 1965; page 211.

5. *The Life of Ian Fleming.* Jonathan Cape, 1966.

cess. But in actual contact with blood and violence Fleming, unlike Bond, was usually nauseated.

In the sixties Bond emerged as a world-wide cult. Tens of millions saw the Bond films. Fleming was too much of a hedonist not to enjoy the limelight, but he could not keep pace with his eternally youthful 007. He had his first heart attack, which he called the Iron Grab, in 1961, but the James Bond factory gave him no rest. In 1964 the Iron Grab struck for the last time. He left £300,000, but the real Bond bonanza was only just beginning.

Fleming was a typically English 'pro-am'. Behind the languid Old Etonian manner and the elaborate façade of elegance was the keenly efficient professional. The same air of effortless accomplishment marks the novels of Eric Ambler—though it is a case of easy reading, hard writing - for Ambler scraps whole sections of his work, rewrites compulsively and is often left with less than a quarter of his original manuscript. Such dedication comes he believes from his hard-working London grammer school, where the headmaster would sweep through the form with the awesome injunction, 'Work, for the night is coming'. Ambler, a chemistry scholar to London University at the age of fifteen and a half, gravitated to thrillers via a copy-writing job with an advertising firm. 'Excellent training -takes all the surplus fat off your prose.'

His pre-war novels such as *The Mask of Dimitrios* (1939) and *Epitaph for a Spy* (1938) are probably his best, but all are the work of a master craftsman. Ambler (b. 1909) was the pioneer of the non-heroic figure in spy fiction 'The two-fisted super-hero, with limitless sexual ability, has never seemed a credible figure to me. Successful espionage has always been the avoidance of violence. My characters run from guns rather than towards them.' In *Dirty Story* (1967) a blue-film-peddling rascal called Arthur Abdel Simpson lives the life of a minor international intriguer with great resource and outstanding cowardice. He even provokes a British Consul to explode: 'Simpson, your life is nothing but a long, dirty story.'

Former parson John Gardner's Boysie Oakes (*The Liquidator* (1964) and *Understrike* (1966) is another anti-hero who puts saving his skin before saving his country, and it is no coincidence that his initials are a derisive BO. James Leasor's part-time agent and full-time country doctor Jason Love is by contrast a lover of vintage cars rather more than women. Leasor's novels such as *Passport to Oblivion* (1964) and *Passport to Suspense* (1967) are characterized by the adroitness of their plots.

One of the most remarkable successes of post-war spy fiction has been that of John le Carré, real name David Cornwell, a former Foreign Office diplomat, who was in his time a junior master at Eton on £11 a week, a struggling free-lance artist and even had a job with a travelling circus washing elephants. All that was before he changed his life dramatically by writing *The Spy Who Came in From the Cold* (1963). This earned him around £500,000 from the sale of film and other rights. 'The Spy' hung fire for a few months in Britain when it was first published, and did not really take off on wings of solid gold until it appeared in America, where its earnest underlying debate on the Cold War ethic was more suited to the public mood. 'Espionage is the East-West battlefield with the secret agent as the infantry,' says le Carré. 'I'd go further. Mankind has always been fascinated by the anatomy of betrayal.' The plot of 'The Spy' is a brilliantly contrived series of climaxes in which the reversals of fortune leave the mind numbed as to who is really the goodie or the baddie. And the answer is that Intelligence is the baddie—ours or theirs—because it regards all men as expendable.

Len Deighton was a commercial artist and BOAC steward before he became a writer. In peak years he has earned up to a million dollars from books and films such as *The Ipcress File* (1962). His spy hero is a fumbling, bespectacled character, anonymous in the book but known as Harry Palmer in the films. He represents a spy world of error, defeat and confusion and occasionally Deighton's plots read that way. But it is a successful formula in novels like *Horse Under*

Water (1963), *Funeral in Berlin* (1964) and *Billion Dollar Brain* (1966), in which a fanatical anti-Communist Texan millionaire forms his own private anti-Soviet army with the aid of a billion-dollar computer. His novel *Bomber* (1970), a massve 160,000 words composed out of a substratum of 400,000 words research, tells in fine focus the story of an RAF bomber raid in the last war.

Just as H. G. Wells presaged so many of the events of the second half of the twentieth century, so present-day science-fiction writers often see the future with greater clarity than the specialist scientist. Somerset-born Arthur C. Clarke had anticipated space communication satellites by more than a decade before Telstar became operational. Once chairman of the British Interplanetary Society and other organizations concerned with space research, he has also written a number of non-fiction works on the subject. With space travel now almost old hat the younger school of British sci-fi writers has turned to the world of inner space, or the mind. As James Ballard puts it: 'The psychological landscape is infinitely more mysterious than the space landscape.' In his novel *The Drowned World* (1963), in which freak heat conditions turn London into a steaming prehistoric jungle, the minds of men revert to primitive levels and instincts.

Brian Aldiss's only space novels have been ironic ones like *Non-Stop* (1958) where space explorers in search of new solar systems find themselves trapped in an inter-stellar vessel winging hopelessly into an infinity of space. 'I feel science fiction writers should go for people not planets. There is knowledge to be found inside ourselves,' says Aldiss. 'In the past million years of evolution man has grown a neo-cortex, a thin layer of "civilized" brain over the old animal brain. And beneath the old animal brain lies a reptile brain. In other words inside the mind of every man there's an alligator in the embrace of a dog. So the world is teeming with intelligent people who also harbour primitive, aggressive instincts. That explains the world today—great technological advance, but also great fear that man will destroy himself.'

So once again the English novel proves itself a powerful

vehicle for important ideas. It has broadened its vision and breadth of subject matter; under the impact of television its style is now crisper and more sophisticated. What has not changed is the appeal of the written story.

Chapter 41

CHILDREN'S BOOKS

Even allowing for Hans Christian Andersen and the Brothers Grimm no nation has given the world so many famous children's characters as the British Alice, Peter Pan, Mr Toad, Winnie the Pooh, Mary Poppins and the rest.

And that seems as good a place to start as any, at a small house off the King's Road, Chelsea, 'in a street so narrow you'd hardly think a worm could live in it'. This is the home of P. L. Travers, creator of Mary Poppins. She is a shy but jolly little woman in her early sixties and the 'P' stands for Pamela, although initials are much preferred. As everybody knows, Mary Poppins is a magical nanny who slides *up* banisters rather than down, descends from nowhere by umbrella and is liable to fly off again on the East Wind.

P. L. Travers, born in Australia of an Irish father and a Scots mother, arrived in Britain in 1924 with just £10 in her pocket, and began by writing poetry. It was in 1934 that Mary Poppins first blew into the middle-class Banks's household to look after her charges Jane and Michael There have been four more Poppins books since and they have been translated into seventeen languages, including a pirated edition in Russia. Although the Bankses live in Edwardian England, and the setting seems as British as a bowler hat, Mary Poppins has had her greatest success in America. The Walt Disney film with Julie Andrews was an added boost.

There is no stranger success story in literature than that of John Ronald Reuel Tolkien (1892–1973), sometime Merton Professor of English Language and Literature at Oxford. Tolkien first started writing fairy tales and heroic romances when he was invalided from the Somme in 1916. Primarily a philologist in Scandinavian languages, he had had a lifelong interest in the twilight world of Nordic, Teutonic and Celtic

myth. He also told his children stories based on ancient lore. Then one day between the wars when he was marking some examination papers he scribbled on a blank sheet: 'In a hole in the ground there lived a hobbit.' He wasn't quite sure what it meant, but from that doodled phrase grew the strange race of hairy, shoeless, laughing, pipe-smoking little hobbits, like Bilbo Baggins, who fight with trolls, goblins, wolves and dragons in the strange world of Middle Earth.

The Hobbit first appeared in 1937, to be followed in the fifties by *The Lord of the Rings* trilogy. Tolkien's passion for his theme developed into this great trilogy, but it is not children's reading. It became a mass cult, particularly on the American campuses, but it was the hobbit that was the starting point and a landmark in children's literature. He is surprised by his success. He wrote primarily for his own amusement. It was C. S. Lewis of *The Screwtape Letters* and the *Narnia* stories for children (themselves part Norse myth and part Christian allegory) who persuaded him to publish. Perhaps the truest slogan of all was the lapel badge that appeared in New Mexico: 'J. R. R. Tolkien is Hobbit Forming.'

Another famous children's character had its origins in the trenches of the First World War—Dr Doolittle, the animals' favourite physician. His creator, Hugh Lofting (1886–1948), was part English and part Irish Obviously the magical elements of the Celtic temperament make for good children's writing. Lofting went to Flanders with the British Army in 1916 and was struck by the sad plight of the horses. Loyal beasts, they served as faithfully as the men, but once wounded there was no one to care for them and usually they were shot. It seemed brutal. If only there were a special animal doctor, thought Lofting, and if he could speak to the animals too. . . . Lofting told his Doolittle stories in illustrated letters to his children from the Front, and later they were published.

One of the most popular children's authors of all time learnt her craft the practical way by telling stories to children as a nursery school teacher. In some forty years till her death in 1968 Enid Blyton published over 400 books—ad-

venture stories about the Famous Five and the Secret Seven as well as the pixie-hatted Noddy and his friends in Toyland. Educational pundits decried Miss Blyton, castigating her for sloppy language and trite stories. Librarians banned her works. But her books sold over 90 million copies in the English language alone, and were translated into thirty-three languages, including Swahili and Russian.

Enid Blyton's greatest virtue is that she gets children reading for enjoyment. Her world may be limited, but children readily understand and appreciate it.

Within a few months of each other, between June 1968 and January 1969, three of Britain's best-known children's writers, W. E. Johns, Enid Blyton and Richmal Crompton, died. Richmal Crompton, a one-time classics mistress, took to writing full time about the escapades of her scruffy, mischievous William after she had had an attack of polio in 1924. William, based on the character of a nephew, remained an ageless ten and three-quarters through four decades. The thirty-seven titles read like a social history of the times, from *William the Gangster* through *William and the A.R.P.* (1939) to *William and the Pop Singers* (1965). He is a middle-class boy from a middle-class home, which started with cooks and a housekeeper and ended with none. William books have sold more than 9 million copies. Equally popular, though they have not been going so long, are the *Jennings* series of school stories by Anthony Buckeridge which show a shrewd insight into the schoolboy mind.

Captain W. E. Johns's experiences as a fighter pilot in the First World War led him to write the famous 'Biggles' adventures of Captain James Bigglesworth, RFC. Biggles, a clean-limbed hero unacquainted with the pleasures of sex and alcohol, was updated with the passage of time to serve as an Air Detective for Interpol. His adventures sell several million copies a year in seventeen different countries.

The most prolific children's author of all time was Frank Richards (real name Charles Hamilton) creator of Billy Bunter, the Fat Owl of the Remove at Greyfriars School. In his prime Richards, whose own public-school origins

were somewhat obscure, was writing 80,000 words a week, many of them for magazines such as the famous *Magnet*, in which Bunter made his début in 1908. Tales of public school japes are somewhat *passé* in an age of near egalitarian education, but Bunter lives on because the fat boy and the glutton will always fascinate and amuse.

The best of children's books can be read at several levels, notably the children's classics in that very British school of 'nonsense' writers of which the Rev. Charles Lutwidge Dodgson, alias Lewis Carroll (1832–98), is the prime exponent. He was probably influenced by Edward Lear's nonsense verses and there is a certain basic logic and telling the truth in the mad worlds of both men. *Alice's Adventures in Wonderland* (1865) and *Through the Looking-Glass* (1872) are often a greater delight to adults than children. Foreigners seeking to understand the strange British mentality swear by Alice. When the Hungarian-born cartoonist Vicky came to live in Britain he took a crash course in Lewis Carroll, and the grin of the classic Cheshire Cat or an event from the Mad Hatter's tea party were frequently used to illustrate the point of one of his political cartoons.

Alice herself was based on Alice Liddell, the young daughter of Carroll's Oxford colleague Henry Liddell, Dean of Christ Church. He first met Alice in 1856 just before her fourth birthday, and the books grew from the stories that Carroll told the Liddell children on a celebrated picnic expedition up the river at Oxford in 1862. Alice later pestered him to write the stories down. Children worshipped this scholarly and amusing bachelor don. Equally Carroll was bewitched by little girls. Some indeed have seen an unhealthy Lolita-ish pre-occupation in his collection of photographs of little girls in varying stages of undress. Certainly Alice's mother, Mrs Liddell, viewed the association with enough concern to bring it to an end. More charitably it could be said that Carroll suffered badly from a stammer and that it was only in the company of children that he felt sufficiently at ease to overcome his handicap. Carroll said his books had no teaching in them at all, but also he makes the Duchess

declare: 'Everything's got a moral if you can only find it!'

Not even Alice is such a household name as Peter Pan, the boy who wouldn't grow up. His creator, Sir James Matthew Barrie, Bart (1860–1937), was the son of a Scots handloom weaver. After novels he turned to writing successful stage plays such as *The Admirable Crichton* (1902). The original Peter Pan was first performed at Christmas 1904, and this too grew out of stories that Barrie, accompanied by his big St Bernard dog Porthos, told a group of small boys in Kensington Gardens. The many versions of *Peter Pan* that have followed the play, from Barrie's book *Peter Pan and Wendy* to the Walt Disney film, are tribute to the magic of Barrie's world of fairy tales, pirates and redskins. Peter Pan is now firmly part of folklore, along with Robin Hood and Dick Whittington.

Another Scot, Kenneth Grahame, born in 1859 just a year ahead of Barrie, was Secretary of the Bank of England, a senior position, but not one that he much enjoyed. So he sought escape into the animal world of *The Wind in the Willows*. The book grew from the bedtime stories he told his son Alastair of Toad, Badger, Mole, Water-rat—these were the secrets the wind told in a whisper among the willows. One of Grahame's great admirers was A. A. Milne (1882-1956), and besides dramatizing *Wind in the Willows* as *Toad of Toad Hall*, in 1929, Milne created his own *Winnie the Pooh* (1926) from the bed-time stories he told to his own son Christopher Robin as he played with his teddy-bear in the nursery. His children's verses *When We Were Very Young* and *Now We Are Six*, published in the twenties, have sold by the million.

If Pooh sometimes lapses into archness and sentimentality no such criticism can be made of the animal world of Beatrix Potter (1866–1943). There is a healthy dash of worldly realism in all that she wrote, as in *The Tale of Peter Rabbit* (1902), when Mrs Rabbit warns her children Flopsy, Mopsy, Cottontail and Peter: 'Don't go into McGregor's garden. Your father had an accident there; he was put in a pie by Mrs McGregor.'

The fictional animal story makes as strong an appeal to younger readers as ever—like the trouble-prone and entirely lovable bear called Paddington who, in the first of the books by his creator Michael Bond published in 1958, is discovered as a lonely and very small bear with the pathetic notice 'Please take care of this bear', his only luggage a half-eaten jar of marmalade and a picture of Aunt Lucy, who is far away in 'Darkest Peru'. Since then Paddington has captured the imagination of tens of thousands of children.

Since the war children's literature has flourished on a higher level than ever before. It is difficult at this stage to single out the names that will be known to posterity, but in our own time such authors as Rosemary Sutcliff, Leon Garfield, Henry Treece, Alan Garner, Philippa Pearce and John Rowe Townsend have all made their impact on the world of children's books, and there are many more.

Graham Greene has said that the books that most influenced him in life were the ones he read as a child—adventure novels by authors such as Rider Haggard, Percy Westerman and Stanley Weyman. There are few pleasures more intense and vivid in life than childhood reading - preferably under the bedclothes by the light of a fading torch, just hoping the battery will last to the end.

Chapter 42

POETRY

'I have always held firmly that a nation which ceases to produce poetry will in the long run cease to be able to enjoy and even understand the great poetry of its own past.' *T. S. Eliot, to the Poetry Book Society, 10th April 1956.*

For a man who has spent almost a lifetime trying to stop the planners, developers and manipulators from destroying the historic face of Britain, Poet Laureate Sir John Betjeman lives in exactly the right place—a tiny cottage with leaded windows in a narrow street off Smithfield called Cloth Fair. On one side of the street is an antique bookshop. On the other side is a bow-fronted house which was one of the few in that part of the City of London to survive the Great Fire of 1666. Inside and up the narrow winding stairs of the cottage you find Britain's most popular poet trying in a distracted way, but with the aid of an able secretary, to fit in yet another appointment in his crowded pocket diary. He is much in demand for television, radio, lectures, articles, interviews and a whole series of public inquiries, where he appears on behalf of some old building soon to be 'developed' (i.e. destroyed). He holds a phone in one hand, shuffles the pages of his diary with the other, gets the months muddled up, decides he can squeeze in a chat with Mrs So-and-So for an hour next Friday afternoon, puts down his diary, forgets where he has put it, gets in a fluster, scratches his bald head in perplexity and looks very puzzled indeed. Suddenly his face breaks into a smile. 'Let's go and have a cup of tea.'

Off we toddle—he walks with small, somewhat shuffling, steps—to a teashop round the corner near St Bartholomew's

Hospital. To you and me a very ordinary teashop, but to Sir John there are hidden treasures if you seek them out. 'See that,' he says delightedly pointing to the ceiling with chrome beading. 'This used to be an old Lyon's teashop, *circa* 1925 I should think.' Betjeman is the poet laureate of ordinary things, of teashops, suburbia, semi-detached houses, branch-lines, the old Great Western Railway, lilac and laburnum in the Banbury Road, Oxford, the derelict tin-mines of Cornwall as well as her twisty village streets. Where most poets rub along with sales of a few hundred copies per book, Sir John's *Collected Poems* in hardback have sold better than a best-selling novel, around 200,000 copies by 1971.

'Why are you the most popular poet in Britain?'

He laughed. 'Am I? What about Mary Wilson? she's sold tens and tens of thousands of copies. Actually I rather like her poems.'

'So do I.' I quote a line or two: '"How like a man, To choose a crowded train to say goodbye."'

He nods approvingly: 'That's fascinating, isn't it? Now I wonder who that man was. He must have existed.'

For Betjeman there is no background so ordinary that it cannot have its moments of high romance, like the couple who meet in *In a Bath Teashop.*

> She, such a very ordinary little woman;
> He, such a thumping crook;
> But both, for a moment, little lower than the angels
> In the teashop's ingle-nook.

'I think that people like something that rhymes and scans, something they can understand.' Actually Betjeman's poetic themes are numerous. With wicked wit he has probed the social habits of the pretentious middle class. 'Phone for the fish-knives, Norman, As Cook is a little unnerved.' He rather glories in being somewhat puny and distinctly unathletic. He has narrow shoulders and his decidedly paunchy profile resembles just a little the bow-fronted window of the house next door. Perhaps that's the reason for the half-humorous references to fearsome tennis-playing women,

those muscular beauties like Miss Joan Hunter Dunn and Pam:

> You great big mountainous sports girl,
> Whizzing them over the net, full of the
> Strength of five.

Or the Olympic girl frowning down 'on an unhealthy worm like me'. But it would be a mistake to think he is either frivolous or continually devoted to parochial themes like suburbia and the class system. His greatest themes are universal, such as the dread of death, especially a lonely death, which his Anglo-Catholic beliefs have not overcome. In 'Five O'Clock Shadow' he writes of 'the lonely terror I feel' in hospital.

> This is the time of day when we in the Men's Ward
> Think 'One more surge of pain and I give up the fight'.

Betjeman's satire is usually soft, but it can be very tough indeed as in 'Meditation on the A 30', which, after making fun of a civil servant's stilted language, records his death in a car crash.

> The first-class brains of a senior civil servant
> Are sweetbread on the road today.

Betjeman was the original environmentalist before it became a vogue word:

> We spray the fields and scatter
> The poison on the ground.

As a boy in the First World War, Betjeman was writing poems at Highgate Junior School where T. S. Eliot was briefly a master, 'but he was too kind to say what he thought of my poems'. At Oxford Betjeman's party-going seems to have got in the way of his studies and he left without taking a degree – although not before his talents had come to the notice of Auden and Sir Maurice Bowra. A succession of fairly brief jobs in journalism followed. His devotion to the antiquities, especially Victoriana, seems to have started as

an act of rebellion against his housemaster at Marlborough, who despised all things Victorian.

Nowadays Betjeman will ride into the fray like a knight on a charger when a Victorian monument is threatened, especially a station. For all their vulgarities the Victorians are to him people to be admired because they had religion and immense hope for the future. He is a literary phenomenon, the first mass-selling bard since Kipling and his imperial echoes.

There has been a grand revival of interest in poetry in Britain in recent years. The evidence can be seen in a score of ways. The Poetry Society now has a 'poetry bank', where tapes, books, films and slides can be used by those interested. The Arts Council has instituted 'Dial-a-Poem' phone services in London and elsewhere. The lines are almost continuously in use. Poetry readings in particular have become immensely popular. The Poetry Society's weekly readings are frequently packed. This revival of the oral tradition has spread now to the annual Poetry International, attended by thousands at London's Queen Elizabeth Hall on the South Bank, where some of the great if ageing names of English poetry like Stephen Spender, Robert Graves and W. H. Auden appear on the same platform as their foreign counterparts and the younger newcomers. Most pleasing of all is that the poetry revival is as classless as the Beatles. Much of the 'pop poetry' movement began, like the Beatles, in Liverpool. Groups like the Liverpool Scene, led by the bearded, paunchy artist-poet Adrian Henri, presented poetry and blues sessions to full houses. Today it is common for pop festivals—protests and sit-ins too—to be accompanied by poetry.

England has an unrivalled poetic tradition. As Germany is celebrated for her great musicians and Italy for her painters, so England is distinguished for her poetry. Shakespeare, greatest of all, Donne, Milton, Shelley, Keats, Byron and Wordsworth are among the supreme poets of the world. Think, too, of the craftsmanship of Tennyson, the excitement of Browning, the rural lyrics of Housman with their

underlying grief, the salt sea-tang and forthright appeal of John Masefield, the lovely, masterful short lyrics of Walter de la Mare, the nature poems of Blunden. The First World War poets, the Rupert Brookes and Wilfred Owens, Blunden again, often seemed to speak for a whole nation, while Siegfried Sassoon's anti-war poems were a profound pacifist protest. Apart from the war poems the strongest theme in English poetry in the first two decades of the century was rural romanticism typified by the Georgian poets.

It was all nostalgia for the countryside of old England and the inn at twilight, what Auden called 'the clock at Grantchester, the English rook'. But by the twenties the moderns had arrived and they put an astringent full stop to the 'is there honey still for tea?' school. Curiously, the revolution in English poetry was launched by the American Pound, the Irishman Yeats and the American-born Thomas Stearns Eliot. He, however, became in some ways more English than the English, being not only naturalized and living in England for the last fifty years of his life, but stating his creed as 'royalist in politics and Anglo-Catholic in religion'. Above all, he was steeped in English literature of the past, Shakespeare and the Jacobean dramatists, and in his work he openly acknowledges it by freely quoting.

The Waste Land (1922) was in stark contrast to the traditional verse of the romantics. It dealt with everyday, rather sordid, facts of life such as the seduction of a bored typist in a squalid room. But the predominant note was of horror at the waste land of contemporary civilization where 'the dead tree gives no shelter'. It is commonly supposed that the bleak aftermath of the First World War—inflation in Germany, revolution in Hungary, the seeming decline in the West—inspired *The Waste Land*. But it was also a reflection of Eliot's own depressing personal plight with his wife Vivienne, a ballet-dancer, becoming progressively more unstable. The marriage broke up in 1932 and fifteen years later Vivienne died in a mental home. Not until 1957 did Eliot find true wedded happiness in his marriage to his secretary Valerie, a bride forty years younger than himself.

Ash Wednesday (1930), packed with religion and allegory, marks Eliot's conversion to Christianity, but he was also fascinated by Buddhist mysticism. This comes out in the *Four Quartets*, published during the Second World War, a meditative and in places obscure poem in which each part is named after a place such as East Coker, the Somerset village from which Eliot's Puritan forbears had emigrated to America three centuries before. He is buried there.

Eliot also demonstrated his original brand of free verse in his dramas such as *Murder in the Cathedral*, *The Family Reunion* and *The Cocktail Party*. He was a disillusioned romantic who believed in original sin, did not think science was the answer to progress, but accepted God's will. Like his friend and mentor Pound he had a certain nostalgia for the authoritarian past; unlike Pound he did not sully his reputation by espousing Fascism and anti-Semitism.

Dame Edith Sitwell belonged to no known school; she was as much a personality as a poet. She and her younger brothers Sir Osbert and Sacheverell were the children of a wildly eccentric baronet Sir George Sitwell, of whom Osbert has left a superb account in one of his volumes of autobiography *Left Hand, Right Hand* (1945). Sir George once tried to pay his son's school fees to Eton in potatoes. He also made Edith wear a steel frame across her face to improve the shape of her nose. He was disappointed she had not been born a boy and never really forgave her. A childhood in which she was exposed to every sort of humiliation and hurt left Edith Sitwell a curious mixture of kindness, waspishness and sensitivity. 'I have devoted my whole life to writing poetry, which is to me a form of religion—and I'm not going to be taught by people who know nothing about it,' she once told John Freeman on a BBC Face to Face interview.

The Sitwells were a literary triumvirate who startled the world by their eccentricity. Edith with her genuine love of the Tudors nearly always wore Elizabethan costume, and jewels on her fingers as big as ping-ball balls. In her early verse she experiments with word pàtterns and sounds. She

described her skittish poems in *Façade*—later set to music by Sir William Walton with Dame Edith reciting through a megaphone—as 'abstract patterns in sound'. Her imagery was startling and freakish. One trick was to use the language of one sense to another, as when the dawn comes in 'creaking' and 'whining'. Sometimes she was too mannered, but later as the state of the world darkened, and her own religious commitment strengthened, she acquired a new depth. Almost echoing Eliot, she published her own protest against modern society and the Depression in *Gold Coast Customs*. The explosion of the first A-bomb shook her deeply and causd her to write 'The Shadow of Cain'; she remained 'haunted ever by the Shadow of Hiroshima'.

Eliot's successors in the thirties—Auden (now an American citizen), Spender, Cecil Day-Lewis and Louis MacNeice—put their faith not in God but in the left-wing gods of Marxism. They found it on the whole a disheartening experience; when the war came the Marxism largely evaporated and Auden became a Protestant Episcopalian. It had been the hope of these poets that their work could be made to speak for the common man: it was a vain hope. Eliot's influence had been profound. By now poetry had entered its difficult phase, too complex, joyless and obscure to be widely popular. After a transient revival of romantic poetry in the war years there were even stronger signs in the post-war period that much English poetry was getting lost in esoteric byways—not much rhyme, still less reason, too clever by half and emotionally dead. It is so no more.

Dylan Thomas was a strong influence in returning poetry to the masses. He had the gift of the gab in verse as in life; his work was, still is, deservedly popular because of his exuberant Welsh command of words. The drama of his career – drunken American tours and notorious behaviour, culminating in his early death in America in 1953 at the age of thirty-nine—have invested him with an added tragic-glamour. In truth he spun more colourful words than ever he did deep ideas, but he achieved, belonging to no style other than his own, a radio audience of many millions, for

his broadcasts in the forties and fifties; his greatest fame came with the radio play *Under Milk Wood*. Thomas's poetry, is written to be listened to and none the worse for that.

Today not only are more people reading poetry, but more are writing it. If rewards for poetry in hard-cover are meagre (Betjeman always excepted) this has not stopped the mushroom growth of small magazines and duplicated sheets. Television may be superseding many art forms, but not poetry. Even television itself uses the technique of poetry in its commercials, because the jingle or rhyme has always been the most memorable way to convey and receive a message. It goes still deeper than that. Poetry seems the inevitable way to express the most heartfelt emotions; there is scarcely a literate person who has not at some time written a love poem.

The king of contemporary love poets, we like to think, is Robert Graves. Though his poetry spans more than half a century and he uses traditional forms, his verse has a certain modern 'cool' about it. He is our longest-living literary exile, havinig spent the last forty-odd years of his life, barring the war, living what he calls a 'peasant existence' on the island of Majorca. In appearance he is most people's ideal of a poet, with a rumpled mane of white hair and an aristocratic profile (slightly flattened nose) that puts you in mind of a Roman emperor. For all his years of exile his poetry remains intensely English. 'Your real nationality is your mother's tongue, the one you write poetry in. For me that will always be English,' he explains. To him the single grand theme of poetry is 'man's birth through woman, his love and death in the arms of a woman'. He talks of his sources of inspiration. 'I can't remember a time when I wasn't in love,' he says. 'There is always some woman to whom I want to address a poem.' In one of his verses he writes:

> That timeless magic first began
> When woman bared her soul to man.

He moved to Majorca in 1929 after the end of his first marriage and resolved never again to live in England, hence

the title of his autobiography *Goodbye To All That*, published in the same year. This bitter denunciation of the war, in which he served and was wounded, is perhaps the finest reminiscence of the First World War ever written in prose. He is a man of immense industry, having published something like 150 books. These include historical novels ranging from Roman times (*I, Claudius* and *Claudius the God*) to Puritan England and the American War of Independence. There are, too, his biblical studies and classical translations including Homer's *Iliad*, which annoyed some scholars by its jokey, satirical style. Much he cares.

Graves with his tough, essèntially traditional, approach to poetry has something in common with the poets of the so-called Movement which emerged in the fifties with Robert Conquest's anthology *New Lines*. The Movement poets, people like Philip Larkin, John Wain and Kingsley Amis, rejected modernism and the obscurities of extreme intellectualism. Artificiality and pretentiousness they scorned. Their style was dry.

They were the 'anti-phoneys', just as Lucky Jim was in Amis's novel. Philip Larkin, a university librarian and jazz critic when he is not writing poems, has emerged as one of the best post-war poets. Some would reject his claim to greatness; he has made no major innovation of style. He is no experimentalist. Of this criticism Larkin shrewdly observed in the mid-sixties: 'I think it is a pity this gap has grown up between poets and the public. The greatest experimental works of the 1920s helped to open the gap up, but now most poetry is a great deal easier than *The Waste Land*. I think the public for poetry is larger than we think, waiting to be found if we look in the right place.' Events have proved him right. Though Larkin's poetic output is slight, a mere four volumes in over two decades, its impact has been significant. *The Less Deceived* (1955) is about love and loneliness: 'Beyond all this, the wish to be alone. . .' In *The Whitsun Weddings* (1964) a frequent theme is death and the decline of life. There is a good deal of disillusion and regret for what might have been in Larkin's poetry, but his great

strength is that he can crystallize and convey a vivid moment of experience.

The poetry of Yorkshireman Ted Hughes is explosive in tone. His best poems have dealt with the animal world, and indeed much of his boyhood was spent pursuing and capturing wild creatures. He is fascinated by the energy and dynamic of the animal world, which he also uses to explore the violence to be found in the human world. Typical is the poem 'Pike' about those mean fish, 'killers from the egg'. Like his contemporary Thom Gunn, who now lives in the United States, Hughes worked in America for a while, and he married the American poet Sylvia Plath, who tragically killed herself in 1963. The real roots of Hughes's inspiration seem to lie in Britain. In his poetry Hughes spares no one and nothing; his style and language are rough, his animals are unforgiving and predatory, his world bloody and menacing *Hawk in the Rain* (1957) was followed by *Lupercal* (1960) and *Wodwo* (1967), which evokes the bleak North Country of the Early Briton. In his latest volume *Crow* (1970) the blood and violence have become extreme and obsessive. When he turns to human beings, they are too often stock figures like the retired colonel, 'a Mafeking stereotype . . . face puffed scarlet with kept rage'. But beyond doubt Hughes is a major poetic figure, some would say the most important British poet since the war.

After some years in the shadows the English poetic tradition has re-emerged as a strong one; there is no longer any one style, rather a ferment of creativity—and controversy. The election for the Oxford Professorship of Poetry in 1968 provoked a sharper campaigning conflict than anyone could remember. Traditional candidates such as Kathleen Raine (an authority on Blake) and poet novelist Roy Fuller (the eventual winner) battled it out against critic A. Alvarez and youthful poets such as Alan Bold from Edinburgh and Barry MacSweeney of Newcastle. In 1969 the Barrow poets, who originally got together in Festival of Britain year to sell books of verse from street-barrows, had so far 'arrived' as to be invited to give a lunch-time recital at Westminster Abbey.

For many people poetry is best suited to the printed page, being essentially a private and personal thing. And yet the revival of oral poetry has distinguished antecedents. The best of it not only reads well aloud but can be studied for greater depth on the page. Shakespeare has been the proof of this for the last four centuries.

Chapter 43

NON-FICTION

One spring day in 1916 Bertrand Russell was attacked by a patriotic mob as he was addressing an anti-war meeting in a church hall in London. Two angry women bore down on him armed with wooden boards full of rusty nails. As they began to belabour Russell one of the pacifist ladies on the platform tried to get the police to intervene. 'He is an eminent philosopher,' said the lady. The police shrugged. 'He is famous all over the world as a man of learning,' she went on. The police did not move. 'But he is the brother of an earl,' she finally cried. At this the police rushed to Russell's assistance.[1]

Not even his earldom could finally save Bertrand Russell from going to prison in 1918 when he declared that the United States Government had called out troops not to fight the Germans but to support capitalism. Such subversive remarks earned him a six-month gaol sentence. He went to prison again in his eighties when his fervent compaigning for unilateral nuclear disarmament overstepped the bounds of civil disobedience. In retrospect this stormy, bird-like figure with his thin, reedy voice and his aristocrat's disdain for widespread unpopularity will be recognized as one of the influential figures of the twentieth century His political posturings were often silly, but he was the Western world's moral hairshirt with his habit of always asking the uncomfortable, awkward questions. His contribution to twentieth-century philosophy was immense and, not least, his lucid, unambiguous prose, with its echoes of irony and dry wit, made Bertrand Russell as much an ornament of literature as he was of philosophy. His grandfather, Lord John Russell,

1 Bertrand Russell, *Autobiography, 1872–1914*. Allen & Unwin, 1967; page 13.

was Whig Prime Minister under Queen Victoria. His mother was a Stanley, member of the Whig family that produced Lady Churchill and the Mitford sisters.

Russell was in part a highly rational being and in part a highly emotional one. His greatest quality was his utter candour, and as a result he wrote one of the great autobiographies of the century, from which the anecdote above is derived. Indeed the three volumes of the autobiography published shortly before his death, aged ninety-seven in 1970, rank alongside Rousseau's *Confessions* as one of the autobiographical masterpieces of all time. In places they are scandalously frank. He had written them in secret fifteen years previously and then delayed publication until all who might be hurt had died. No man has ever committed to public print in his lifetime a more revealing account of his turbulent private, mental and, indeed, public life. He writes in his first volume: 'Three passions, simple but overwhelmingly strong, have governed my life: the longing for love, the search for knowledge, and unbearable pity for the suffering of mankind. These passions, like great winds, have blown me hither and thither, in a wayward course, over a deep ocean of anguish reaching to the very verge of despair.' His private passions were no less vehement than his public passions. They included four marriages, numerous affairs (not always terminated with the 'unbearable pity for suffering' one might have expected) and several attempts at suicide. Highly sexed but guilt-ridden by the puritanical Victorian attitude to masturbation, he first contemplated suicide as a sixteen-year old. 'I did not, however, commit suicide because I wished to know more of mathematics.' Angered by some teasing remarks, he once tried to murder his Cambridge flatmate by strangling, but relented at the last moment as the man grew livid.[2] Thoughts of suicide, usually averted by preoccupation with mathematics, also dogged his love life. As a man of ardent sexual passion he knew quite positively when he was in love—and when he was not, an attitude not conducive to lasting marriage. 'Marriage and all such close

2. *Autobiography, 1872 1914*, page 44.

relations have quite infinite possibilities of pain,' he observed. He thought with his heart as well as his head.

His life was often governed by a series of great emotional leaps rather than sober assessment of issues, and this was especially true of Russell in politics. During the Boer War he switched in the space of five minutes from being an imperialist to being a pacifist, a sort of semi-mystical conversion as a result of seeing the agony and solitude of a crippled woman.[3] Yet in 1948 the man who was to become a great nuclear disarmer even advocated a 'preventive war' against Russia when the West alone had the A-bomb. For so clever a man he could be very silly, and in later life common sense often deserted him for the querulousness of the old man. Yet his achievements stand high, not only for his autobiography but for his many other books, including popular and clear works on academic themes such as the monumental *History of Western Philosophy*. He won the Nobel Prize for Literature in 1950, but his greatest achievement was in the realm of pure philosophy. In *Principles of Mathematics* (1903) and *Principia Mathematica* (1911), which he wrote with A. N. Whitehead, he sought to demonstrate that all mathematics is a branch of logic and can be reduced to symbolic logic. He and Whitehead not only shifted the foundations of mathematics but forged a useful tool in the hands of philosophers to the extent that philosophy has never been quite the same since. It was mindbending work. 'My intellect never quite recovered from the strain,' he once said. Many traditional philosophical conundrums are the result of the ambiguities of language and the vagaries of syntax; use of symbolic logic enables a philosopher to cut through to the heart of a problem, and often to show it to be a non-existent one. Russell was an empiricist in the tradition of the great British philosophers, Berkeley, Locke and Hume.

Empiricists believe in only two kinds of knowledge, empirical and deductive. Empirical knowledge is what you gain through the senses (that bus is red). Deductive knowledge is

3. ibid., page 146.

a process of pure logic -as in a mathematical proposition. As a rule this leaves no room for the ambiguities of metaphysics. To be empirical is to be agnostic. Russell, despite a puritanically pious upbringing by his grandmother (he lost both parents at an early age), had in any case lost his faith by the age of fifteen. The empiricist is a man who proceeds by doubting and testing every proposition, whether accepted or not. Given the statement 'God exists', the empiricist would first attempt to analyse what it meant; having done that he would conclude that the statement was meaningless, since it was neither deductively true nor empirically verifiable This school of thought finds its most eloquent present-day practitioner in the Oxford professor A. J. ('Freddie') Ayer, whose first book *Language, Truth and Logic*, published at the age of twenty-five, is a model of compressed clarity. To many, such linguistic analysis has turned philosophy into an arid cul-de-sac; but it remains true that to answer any fundamental question you have to be quite clear precisely what question it is that you are asking.

The accomplished man of letters for whom writing is just one of many occupations is a characteristically British figure. Sir Harold Nicolson, married to poet and authoress Victoria Sackville-West, had a fourfold career as diplomat, politician, author and critic. His official biography of George V won him his knighthood. But as a man who mixed on easy terms with the giants of his day from Asquith to Macmillan he wrote some wonderfully revealing diaries, covering three decades of political and literary affairs and gossip.

Few men are instantly recognizable by their initials. A P. H was one of them. Sir Alan Herbert was many things in his time; an Independent MP for fifteen years (sitting for Oxford University, one of the old university seats now abolished), an amateur sailor, a librettist and playwright (seventeen plays), the author of sixty-two books and much light prose for *Punch* and other journals, a witty versifier, an ardent campaigner and a successful reformer. He got the divorce laws reformed before the war not only by pushing through the Matrimonial Causes Act in Parliament, but also by

writing beforehand an extremely witty exposé of the absurdities of the law in his novel *Holy Deadlock*. For over fifty years he lived in the same house in Hammersmith overlooking the Thames. His novel *The Water Gipsies*, later a musical, was all about canal folk and his love of boats. 'I am always sad to leave a ship, always glad to leave an aeroplane.' For thirty years he was a Thames Conservator; he successfully fought to abolish Entertainment Tax, stopped the Government's war-time proposal to put 33 per cent purchase tax on books, was one of the main instigators of the Obscene Publications Act which, as he said, 'saved *Lady Chatterley's Lover*—and a good many others', and cried out for authors to receive some payment for books borrowed from public libraries. The power of the spoken word and the pen is still a mighty one, especially when it is used with the wit, humanity and good humour of an A.P.H.

In an age of rush the reflective essay has largely gone out of fashion. The last heyday of the essay belonged to the era of Chesterton, Belloc and Sir Max Beerbohm. 'The Incomparable Max', who made his name as impudent wit, satirist and caricaturist in the nineties, then reached a whole new audience almost half a century later through his radio talks, a technique which he mastered at once. G. K. Chesterton, a man with a Falstaffian figure, a vast output and a delight in paradox, had the journalist's instinct for the common man. Whether in his crime stories featuring the priest detective Father Brown, his biographies or his essays, Chesterton was generally to be found fighting for common sense and Roman Catholicism. He could draw too and illustrated books for his close friend Hilaire Belloc, who was born in France but educated in Britain. Bernard Shaw regarded them as a composite creature, the 'Chesterbelloc', and both were great Catholic polemicists. Besides numerous works of history, travel books and much lyrical verse, Belloc was an accomplished essayist, though the very titles of his collected work published before the First World War—'On Nothing', 'On Everything', 'On Anything'—speak of a more leisured age. Here and there the essay still lives on. Sir Neville Cardus,

even as an octogenarian, still delighted with his thoughts on topics as varied as sex, God, Klemperer and cricket. 'I have never written with a public in mind. I have written for myself, to get to the bottom of myself and, mainly, to enjoy myself. Writing has been my liquor, my pill, my drug, my aphrodisiac.' He managed to communicate the enjoyment and the addiction. Even adamant non-cricketers will read a Cardus essay on cricket.

Cicily Isabel Fairfield is not the most impressive name for a would-be author of distinction. That perhaps is why Miss Fairfield, who began her career as an actress, adopted the name of Rebecca West after the Ibsen heroine who plunged to her death in a millrace. Once an acidulous critic ('She removes the skin of her victims with a happy laugh,' it was once said) and still an acute commentator, Dame Rebecca has published a handful of novels of which several are justly famous—*The Thinking Reed* (1936) (moral dangers involved in marrying a very rich man), *The Fountain Overflows* (1957) (tensions in a musical family) and *The Birds Fall Down* (1966), a long and elaborate story of revolutionaries, Czarist secret police and a double agent at work among an aristocratic Russian family exiled in France. This is very much Dame Rebecca's territory. No one has better analysed the nature of international espionage in real life. In *The New Meaning of Treason* (1949) she reported on the gallery of traitors like 'Lord Haw-Haw' who stood trial after the war for collaborating with the Nazis. She has written several books on trials since then, most notably *A Train of Powder* (1955).

The mid twentieth century has produced a whole galaxy of British historians who combine high scholarship with readability. The Oxford don Hugh Trevor-Roper became internationally famous with *The Last Days of Hitler*, published in 1947. The first edition sold out in a month and was translated into sixteen languages. Appointed by British Intelligence immediately after the war to investigate Hitler's death—at a time when the Russians were being very mysterious—Trevor-Roper's task was made more difficult because

the Russians had the body and suppressed the autopsy report (it was produced, in a suspect version, only in 1968). Even so Trevor-Roper's original report, written after painstaking research and cross-examination of all available survivors from the bunker, remains valid in all essentials. His contention that Hitler shot himself as opposed to taking poison (which is what the Russians argue, presumably because this is a less heroic death) is still the most credible and has been reinforced by the evidence of German prisoners returned to the West from Russia. Fellow Oxford historian Alan Bullock wrote the first complete life of Hitler, and that too became a best-seller, being for many years the only authoritative history of the Third Reich. Another Oxford historiain, Robert Blake, has been particularly successful as a biographer of Disraeli, revealing him to have a wildly disreputable youth for one destined to become a Victorian Prime Minister.

A. J. P. (Alan John Percivale) Taylor brings an impish wit to the task of writing history. One suspects there are occasions when he enjoys being different, and his *Origins of the Second World War* (1961), with its suggestion that Hitler really went to war by accident and had no grand design of conquest, caused particular controversy. Trevor-Roper, who by this time was occupying the chair of the Regius Professor of Modern History at Oxford, an appointment which had been widely tipped to go Taylor's way, described Taylor's thesis as preposterous. Taylor claimed that there had been no piling up of 'monstrous German armaments'; Trevor-Roper countered by saying that that was because Hitler was thinking in terms of a short sharp *Blitzkrieg*. Taylor's views, however provocative, are backed by sound scholarship. He is a relaxed and amusing lecturer who speaks without notes for an hour on end to either students or a television audience. His studies of modern Europe include *From Napoleon to Stalin* and *Bismarck*, but perhaps his finest achievement is *English History 1914–45*, in which he proved himself to be a superb all-round historian, gathering together all the var-

ious themes political, military, social and economic into a coherent and stimulating narrative.

Sir Arthur Bryant is the doyen of popular British historians and a great patriot. Read any one of his splendid histories of Britain and you can almost smell the roast beef of Old England as it sizzles on the spit. His life of Pepys, the founder of the Navy and a skilful wenching man, has sold over 300,000 copies. But what makes easy reading is hard writing. Sir Arthur writes and re-writes his paragraphs at least twenty, and sometimes thirty, times. His research is meticulous. 'For every paragraph in one of my books I have probably written about 600 pages of notes' An old Harrovian and son of Sir Francis Bryant, a Court official, he is a student of the British character 'It may seem odd to talk of a national character. We've fifty million people and all different.' But he believes this island race has been formed by the climate. 'It is mild, misty and foggy and this makes us equable and calm, although sometimes rather slow in the uptake. Immigrants are affected by it too After about ten years here they become much less excitable. Our political stability and the ability to change a government without revolution have given us a hatred of violence.' In his book of essays, *The Lion and the Unicorn*, Sir Arthur derives his title from the two broad strands he sees in the national character. 'The lion is dogged and unshakable, full of common sense and magnificent in adversity as in 1940. The unicorn represents the eccentric, light-hearted side of our character —from mini-skirts to our dottiness about pets. Drake was a lion when he defeated the Armada, but a unicorn when he insisted on finishing his game of bowls before the battle started.'

Elizabethan history has been the life's work of Cornish-born Alfred Leslie Rowse. Let it be said at once that there have been few livelier or more opinionated controversialists, few too with a richer feeling for places and far-off times and the power to convey this to the reader. On the eve of the 400th anniversary of Shakespeare's birth in 1964 Rowse unleashed on the world, in a biography and treatise on Shake-

speare's sonnets, a series of categorical pronouncements which provoked an immediate storm and irate rejoinders from other academics. Though scholars have been confused and divided for almost four centuries over the autobiographical mysteries of Shakespeare's sonnets, Rowse answers with an almost scornful certainty. When were the sonnets written? (1592–4.) For whom were the sonnets written? The young, effeminate Earl of Southampton (not to be confused with Southampton's stepfather Sir William Harvey, who, claims Rowse, was the 'W.H.' of the sonnet's dedication). Who was the Rival poet who figures in the sonnets? Christopher Marlowe. Who was the mysterious Dark Lady alluded to? Even Professor Rowse is stumped by that one.

Unperturbed by the doubts of lesser scholars down the centuries, and not in the least put off by the refutations of such respected Shakespearean authorities as the late Professor J. Dover Wilson, who dates the sonnets from 1597 onwards, Rowse declared: 'I am not proposing another thesis: the problem is solved, as is clear for all to see.' Rowse has also given us a touching account, in *A Cornish Childhood*, of a boy growing up in the early years of the century in a poor family amidst the china-clay works of a remote village. The sequel *A Cornishman at Oxford* was a savagely honest account of the hopes and miseries of a scholarship boy who enters the toffee-nosed world of Christ Church, Oxford. Behind the cocksure mask is a vulnerable character.

Of the younger historians several names stand out. Alistair Horne has treated the key issue of modern European history till 1945 that of Franco-German rivalry -in a highly illuminating way by examining in depth the three great turning points in France's destiny. There was *The Fall of Paris: The Siege of the Commune 1870–71*, followed by *The Price of Glory: Verdun 1916* and concluding with *To Lose a Battle: France 1940*. In examining these three great traumas of the French people and the way in which the first two tragedies seemed to lead on to the third, Horne has written a trilogy full of insight into the tortured psychology and prickly vanity of the French.

One of the greatest and perhaps the most influential of military thinkers and historians in the twentieth century was Sir Basil Liddell Hart (1895 1970)—a soldier in the First World War and then a military correspondent. He originated modern theories of tank warfare. He had a big influence on British military thought in the pre-war years, but alas an even bigger influence on the Germans, who described him as 'the theoretical originator of mechanized war'. The Nazi Panzers took his lessons to heart, and in 1940 Guderian turned theory into practice when his tanks overthrew France, Liddell Hart wrote biographies too of Sherman, Foch and Lawrence of Arabia.

Correlli Barnett, even though he is primarily known as a military historian, is very much more than a chronicler of battles. He started his career in controversial fashion with *The Desert Generals*, which took a critical view of Lord Montgomery's performance at Alemein. Subsequent books, notably *The Swordbearers*, studies in supreme command in the First War, do very much more than deal with the 'sharp end' of war, because indeed there is very much more to a war than the generals, their plans and their troops. For instance, the study of Jutland in *The Swordbearers* demonstrates that much of the Royal Navy's failure to press home the advantage of superior numbers against the German High Seas Fleet was due to backward technology in the British steel industry, which caused weaknesses in ship design and armour. In *Britain and her Army* Barnett looks at the Army in its social context as well as its military role, and concludes that Britain has an anti-Army feeling traceable to the first Elizabethan sea-dogs—Drake, Hawkins and Raleigh. He attacks 'the most seductive and enduring of English myths: the myth of sea-power'. The prestige enjoyed by the Navy was later transferred to the RAF. But continental wars can still only be won with an army.

Robert Rhodes-James, who curiously got only a second-class degree in history at Oxford, has proved himself a notable biographer of Winston Churchill's father Lord Randolph Churchill, and of the Victorian Premier Lord Rosebery. He

has edited the memoirs of Lord Davidson, former Tory Party chairman, and the best-selling diaries of the waspish and incredibly snobbish socialite Tory MP, the late 'Chips' Channon, whose worm's eye view of great events, whilst frequently quite mistaken, is also amusingly revealing. Rhodes-James, having already written a sound study of the disastrous Gallipoli campaign, which was largely Churchill's initiative, then turned to *Churchill: A Study in Failure 1900–39*. In it he attempts a serious and fundamental revaluation of the great man, concluding that it took the desperate national crisis of 1940 to restore Churchill's fortunes and reputation. His candid attack is well documented, but seems to lack the balanced view of previous work; for though Churchill's pre-war record is open to criticism on very many points, he was right, when few others were, on the great fundamental menace of Nazism and his warnings were all too well vindicated by subsequent events. A one-time senior clerk in the House of Commons and Fellow of All Souls, Rhodes-James, born in 1933, is one of those historians that powerful political families first think of when they have papers to be edited or woven into an informed biography.

Martin Gilbert, also in his thirties, made a name for himself in various probing studies of pre-war appeasement policy before being chosen to complete the work begun by the late Randolph Churchill – the definitive six-volume biography of Winston Churchill. Two volumes were published by Randolph Churchill. Gilbert, an energetic researcher with a nose for exciting revelations, and not over worried if he upsets the susceptibilities of the famous, has published the third volume and is now working on the remainder.

Among women historians C. V. (Cicely Veronica) Wedgwood, one of the famous pottery family, has written brilliantly of the English Civil War in *The King's Peace* (1955) and *The King's War* (1958). There was also a pre-war biography of Oliver Cromwell, who has also proved an intriguing subject for Antonia Fraser. She sprang to prominence as an historian in 1969, with a deeply felt biography *Mary Queen of Scots*, which has been a best-seller on both

sides of the Atlantic. Despite her emotional commitment to her subject, to the extent that she found herself sobbing when she came to write about Mary's execution scene, Lady Antonia cannot be challenged on the depth of her research. Her mother, Elizabeth Longford, has written fine biographies of Queen Victoria and the Duke of Wellington.

Nancy Mitford – besides giving us her famous dictates on U and non-U behaviour – produced a variety of historical smash-hits of which the greatest was her biography of Louis XIV *The Sun King* (1966). She followed this with a biography of Frederick the Great (1970). 'Most historians go for trends in economics and things. I'm more interested in people and in character,' she said. 'I love Frederick, because he is so funny. I know Napoleon and Hitler modelled themselves on him. But they got him all wrong. They thought he was a tyrant like themselves. Not at all. Really he was terribly humane and at the same time a bit ridiculous in his pretensions.' Miss Mitford, perhaps the best known of the six remarkable daughters of the second Lord Redesdale, brilliantly re-created her extraordinary upbringing in her novel *The Pursuit of Love* (1945). Her own rather ferocious father, who horsewhipped his daughters from time to time, was the eccentric Uncle Matthew of *The Blessing* (1951). But Miss Mitford retired from novel writing in favour of more lucrative historical works. She lived in Paris from the end of the war, but remained splendidly aristocratic and English in speech and habit – with Cooper's Oxford marmalade on her toast, even at tea time. One must mention, too, Cecil Woodham Smith (b. 1896), whose great historical successes such as *Florence Nightingale* (1950), *The Reason Why* (1953) and *The Great Hunger* (1962) came somewhat late in her life. For a nation so rich in history Britain is well endowed with the historians to write about it.

Chapter 44

THE BRITISH THEATRE

'I think the theatre, more deeply than most entertainments, gives the audience that sense of participating in a performance which, as in music, no recorded performance can quite come up to. It is something which is not merely watching but which involves.' *Sir Laurence Olivier*

John Osborne remembers the date of 8th May 1956 very clearly. 'For one thing is was my father's birthday, besides being the anniversary of VE Day.' It was also the night that the British theatre was reborn after years in the doldrums. *Look Back in Anger* had its première at the Royal Court Theatre, and for the next decade and a half Britain was to be the dramatic centre of the world. Nobody rings a bell to signal the start of a new epoch; only in retrospect do you see that this was a turning point.

The truth is that 'Look Back' started rather inauspiciously. The first reviews were good enough, except for *The Times* and the *Daily Mirror*, but the newly formed English Stage Company had scheduled it to run for only three nights, Thursday, Friday and Saturday. It had popped in through the stage door, so to speak, for a limited run only and in response to an advertisement in *The Stage* by the company's director, George Devine, for new plays. The following week it was to be replaced by something else. 'When the reviews appeared in the Sunday papers people began ringing up for seats for a play that was already supposed to be off,' recalls Osborne. Fortunately 'Look Back', with its cast of only five, was fairly easy to reassemble. Even so, progressive theatre being mainly a minority spectator sport, it needed the boost of a television excerpt followed by a ninety-minute production on ITV before 'Look Back' became a nationally talked-

about phenomenon. From then on it was not just a controversial play by a promising young writer, but an explosion of angry defiance which became the battle cry of a whole new generation. The frustrated wail of the anti-hero Jimmy Porter, 'there aren't any good brave causes left', precisely echoed much of youth's mood of disillusion, especially working-class youth. The working-class meritocracy who had been to grammar school or even redbrick university, like Jimmy Porter, still felt themselves vitiated by the class system and what they regarded as the rotten deadness of British society. Jimmy has married above himself and in their squalid Midlands attic flat he showers his wife, Alison, a colonel's daughter, with vitriolic jibes about her upper-class background. Jimmy is a would-be intellectual, but perversely keeps a sweet stall with his more slow-witted partner Cliff. Alison finally leaves Jimmy, who then takes up with her best friend Helena. When Alison returns he finds she has had a baby but lost it. Shamed for once he takes her back and now she comes to him in a way he finds more acceptable. 'This is what he wanted from me,' she says. 'Don't you see, I'm in the mud at last. I'm grovelling. I'm crawling. Oh, God. . . .'

Recalling the extraordinary impact of the play Osborne says: 'It was partly luck, a matter of opening the right door at the right time.' Though the form of the play was not revolutionary, its contents, the raw emotion and rough language, certainly were. 'I think quite a lot of people do behave like Jimmy and were doing so, but not on the English stage at that time,' says Osborne. The elders of the London theatre were horrified. 'Look Ma, how unlike Terence Rattigan I'm being,' was how Terence Rattigan summed it up. And what did Mr Osborne think of Mr Rattigan? 'About as much as Rattigan thinks of me. Not much. He has no passion, has he?' lashed back twenty-five-year-old Osborne, who had leapt from out-of-work actor to rather notorious celebrity in a matter of weeks. And Noël Coward? 'He doesn't *care*, does he? He never *cared*.'[1] Sir Laurence Olivier (ditto Gielgud) loathed the play when he first saw it, but was too

1. The *Evening Standard*, 7th July 1956.

great a man of the theatre not to be infected by its urgent vitality when he saw it again. He asked Osborne if he had a part for him in his next play, and the following year Olivier was starring as Archie Rice, the disillusioned deadbeat music-hall hack in *The Entertainer*.

Osborne was of the age to be keenly aware of the Labour victory of 1945, and the promised bright new dawn that had somehow dwindled into the same stuffy old establishment twilight. 'Don't you feel we have a lot to be embittered about?' he angrily inquired of an interviewer at the time. 'There's political disillusion. Men feel uneasy but don't care. Mr Attlee is in the House of Lords and that sums the whole thing up.'[2] 'Look Back' coincided with a mood that was widespread in literature and elsewhere. For Britain as a whole 1956 was a low point: a year of economic recession, the unhappy Anglo-French Suez venture and the chill caused by Khrushchev's sabre-rattling as he found in Suez the alibi for the rape of Hungary. Even before this the press, sensing the mood among the young, had coined a phrase that stuck—'Angry Young Man'. Under this umbrella category came Kingsley Amis and his *Lucky Jim* and Colin Wilson with his much-praised book *The Outsider*, which at the age of twenty-four he somewhat portentously described as 'an inquiry into the nature of the sickness of mankind in the mid twentieth century'.

Fifteen years on and Osborne in his forties has certainly moved a long way, economically, from those early days. The boy who left school at fifteen is now almost certainly a millionaire. His home is a sumptuous one in Chelsea Square with its own private courtyard, wall-to-wall mirrors and tigerskin rugs on the wood floors. Is he angry no more, has he moved to the right? As we sit sipping a gin and tonic on the black leather sofa he seeks to put the whole 'Angry' phenomenon into perspective. 'Personally I don't think I was all that much of a chip-on-the-shoulder person. It's a mistake to identify a playwright or a novelist with the person he writes about. Quite a bit of it was written tongue in

2. The *Daily Mail*, 9th June 1956.

cheek. I mean that. Don't mistake me; the play was *felt* all right, but part of it at least was supposed to be rather funny.' That is not the way the play comes across. Its subject is Anger and that was the essence of Tony Richardson's original production, Kenneth Haigh's stage performance and also Richard Burton's rather over-acted Jimmy Porter in the film.

Anger, too, was the theme of Osborne's celebrated letter in *Tribune* in 1961: 'This is a letter of hate. It is for you my countrymen. I mean those men of my country who have defiled it. . . . You are its murderers, and there's little left in my own brain but the thought of murder of you. . . . I carry a knife in my heart for every one of you, Macmillan, and you Gaitskell, you particularly. . . . Damn you England. You're rotting now and quite soon you'll disappear.' A decade later Osborne smiles at that effusion without too much embarrassment. He has also gone on record in a letter to *The Times* (2nd September 1968) saying that if he lived in America he would be looking for a civilized country to live in and if he were in Russian he would long since have disappeared without trace. In short, there is some relief at being alive and well and living in London. He told us: 'I think it's England that has changed since the days of the "Damn You" letter, not me. Youth no longer feels so isolated from the older generation. We speak a communal language now, and the whole pop culture has spilled right over the class barrier. Everywhere you look there has been change which is now taken for granted, the abortion and homosexual law reforms, the ending of censorship of the theatre and so on. As for the class system, it still exists, but rather as a quaint and amusing game, a sort of maze that it's fun to try to thread your way through. A decade ago I don't think Heath, a mere grammar-school boy, could ever have become leader of the Tory Party. Mind you I don't think I'd ever vote for him. But I did vote Liberal at the last election; Jill's [his wife] great-uncle, I discovered, was the Liberal Prime Minister Campbell-Bannerman.' (Jill Bennett, starring in some of his later plays like *Time Present*, is the fourth Mrs Osborne, having

followed Pamela Lane, Mary Ure and Penelope Gilliatt.)

Writing plays is still the main thing in his life, although he enjoys acting in a play or film, and he also writes film scripts, including the hugely successful *Tom Jones*, whose royalties are riches indeed. 'Frankly it is obscene the amount of money I can earn from a film script—probably as much as it costs to make a low-budget film. I don't find myself too much on the same wavelength as some of these Hollywood moguls, but the money is agreeable and writing a film script can act as a sort of mental lubricant in between plays.' His plays gestate slowly in his mind; he does not start to write until he feels he has got most of the ends tied up.

He has mellowed, whatever he says, and he has also matured as a playwright. There have been one or two flops, such as the ill-starred musical *The World of Paul Slickey*, in which Osborne, none too subtly, vented his spleen at his old enemy the gossip columnists, although even here he betrays a certain love-hate. He was a journalist himself once, earning 45*s*. a week on two trade magazines, *Gas World* and *Nursery World*. 'Journalism always fascinated me. It was odd how when you really talked to those gossip column people they were full of self-deprecation and said that of course they didn't really like doing it. They were being beastly without really feeling it—a sort of gratuitous malice.' For Osborne above all it is feeling that counts: 'If one can't have friendship acrimony is preferable. Indifference is awful.' His historical play *Luther* (1960), rude words and all, is a craftsmanlike work, especially memorable with Albert Finney in the title role. *A Portrait for Me* (homosexuality in the Austrian Army) also dramatizes historical material, but both lack the full Osborne dynamic of personal commitment.

His own favourite play and by common consent his best, *Inadmissible Evidence* (1965), concerns a middle-aged solicitor, Bill Maitland, with a wife, a mistress, a daughter and much unhappiness. He cannot communicate because nobody is listening to him or really cares. 'I felt myself to be in absolute technical command with this play. I remember watching

the rehearsals and thinking "Have I just written another of those trivial little television dramas?" and then Nicol Williamson came on playing a man much older than himself, but he sustained the whole thing and I knew it was good.'

In *Time Present* (1968) Osborne has a woman as the main character for the first time, a 'resting' actress Pamela, played by his wife Jill Bennett—a role which won for her the Variety Club's Best Actress award. At the same time and in an adjacent theatre Paul Scofield was playing the lead in *The Hotel in Amsterdam* and 'Look Back' was being revived in another theatre. In *The Hotel in Amsterdam* three couples steal a week-end in Amsterdam to get away from a movie mogul who dominates their lives. Movie moguls are not Osborne's favourite citizens. 'I object to the way they think they can buy your life. When I do a film script I write into the contract that they cannot buy 100 per cent of my time.' In *West of Suez* (1971), set in a recently independent colony, he betrays his familiar love-hate complex towards the old order.

Osborne has been criticized for writing plays that are long, passionate monologues for the lead characters while the rest of the parts are dwarfed. 'You could say the same about Hamlet. But where would he be without a supporting cast? You can't soliloquize in a vacuum. In any case quite a lot of supporting characters in my plays have won awards. That couldn't happen if they were really one-character plays. An awful lot depends on the casting. I suspect that part of the criticism of my plays stems from the fact that people just don't listen and that includes the theatre critics, bless 'em.'

Though 'Look Back' is something of a period piece now, its influence was immense. The English Stage Company coined large profits from the sale of film and other rights in 'Look Back' and in *The Entertainer*; in five years they earned some £50,000, which was about twice the size of the Arts Council subsidy. As a result they discovered playwrights such as schoolmaster N. F. Simpson (the mad farce of his *One Way Pendulum* has something of the Goon Show's humour in it), Ann Jellicoe (*The Sport of My Mad Mother*

and the kinky sex comedy *The Knack*) and John Arden from Barnsley. He started his career as an architect, but has since written some of the more intriguing plays in the new British drama, such as *The Waters of Babylon* (1957) and *Live Like Pigs* (1958) about the social warfare between two families, one of them gipsy, on a council estate. In Arden's most famous play, *Serjeant Musgrave's Dance* (1960) a recruiting sergeant and a party of deserters arrive in a northern mining town in the 1880s with news of a local lad who has been killed by natives in foreign parts. The sergeant has a missionary fervour to bring home the horrors of war. For shock effect he even exhibits the skeleton. It appears that five natives have been killed for the deed and now Musgrave proposes to kill twenty-five leading townsfolk by way of expiation. However, his plan is cut short by the arrival of dragoons and the arrest of the deserters. The miners celebrate the return to law and order with a dance, and Arden leaves us wondering whether he has written an obscure pacifist tract. It neither is nor is not, for Arden always takes a neutral moral position.

During this period of the English Stage Company's most vigorous flowering (George Devine, one of its founders and director for nine vital years, died, alas, in 1966) the Company helped bring to prominence such playwrights as Pinter, Wesker and Shelagh Delaney (*A Taste of Honey*). 'The theatre is only a minority interest and the Royal Court is a minority of a minority,' says Osborne. 'All the conventional West End managements who got so angry with us simply weren't in competition. They were merely blaming us for their own shrivelled failures and ineptitudes. The commercial theatre is probably not much different from what it ever was. But minority though we were the ripples spread everywhere —into films and television.'

When Osborne and Tony Richardson started Woodfall films it was not so much a ripple as a tidal wave that spread through British cinema—films like *Look Back in Anger*, *The Entertainer*, *A Taste of Honey*, *Tom Jones*, *Saturday Night and Sunday Morning*, *The Loneliness of the Long-*

Distance Runner and *The Knack*. The first two struggled to make money—after that it was all success. *A Taste of Honey*, with its story of an unmarried mother befriended by a homosexual, was a distinctly risky production for the climate of those times. 'It cost us about £118,000 to produce and was tremendously profitable,' says Osborne. Woodfall acquired film rights in Alan Sillitoe's *Saturday Night and Sunday Morning* for about £4,000 after another producer had allowed them to lapse, and besides establishing Albert Finney as a star it had an enduring success, as did the film version of Sillitoe's story *The Loneliness of the Long-Distance Runner*. Woodfall made stars of Rita Tushingham and Rachel Roberts, launched Richardson himself, Karel Reisz and Peter Yates as film directors. Osborne and Richardson have now gone their separate ways, but Woodfall's mark on the British cinema has been permanent.

Another protégé of the English Stage Company was Arnold Wesker, son of an East End tailor. His parentage is Russo-Hungarian and the family background was left-wing. A lot of this comes out in Wesker's interconnected trilogy of plays, *Chicken Soup with Barley* (1957), *Roots* (1959) and *I'm Talking about Jerusalem* (1960), which brought the world of the East End working class to the theatre at a time when it was used to more refined fare. *Chicken Soup with Barley* is a highly ambitious first play covering two decades, 1936 1956, in the life of the East End Kahn family, which is dominated by the mother Sarah, Yiddisher Momma and firebrand Communist, who arranges demonstrations at the time of the Spanish Civil War. As the years progress the Kahn children and husband Harry, who spends much of his time unemployed and asleep, become disillusioned. The Welfare State has abolished the need to fight for a cause any more. Only Sarah remains an unrepentant firebrand committed to the party. 'Socialism is my light, can you understand that? A way of life ' In the sequel *Roots*, acclaimed by the critics not least because of a brilliant performance by Joan Plowright, later to become Lady Olivier, one of the Kahn children, Ronnie, be-

comes engaged to Beatie Bryant whose people are Norfolk farmers. He tries to convert her to his cultural ideas and fails. When Ronnie decides that marriage will not work, Beatie suddenly finds how unreal Ronnie's ideas of workers living in a sort of William Morris style communion with nature really are. She learns to stand on her own two feet. In *I'm Talking About Jerusalem* Wesker is still hankering after his rustic ideal, the simple rural existence of honest craftsmanship. The Kahn daughter Ada and her husband Dave set up a cottage industry making furniture in Norfolk. But the experiment fails and Dave and Ada return to London. In the age of the machine the independent craftsman is odd man out.

Wesker, an ardent socialist, has been in his time a carpenter's mate, a plumber's mate, bookseller's assistant, kitchen porter and pastrycook, which was to have been his career before he turned to plays via a short flirtation with films. (It was while he was on a short course at the London School of Film Technique that he first caught the eye of director Lindsay Anderson with a brief but touching film script *Pools*, about an old lady from the East End who mistakenly thinks she has won the pools.) Food figures prominently in his titles and plays. *The Kitchen* depicts a day in the life of the staff in a restaurant kitchen. Among the saucepans and the hot-plates we are expected to see a microcosm of life.

Wesker's formal education was almost the minimum: elementary schools in Hackney and Stepney were followed by a course in book-keeping and shorthand. His two years of National Service in the RAF helped to inspire *Chips with Everything* (1962), the story of an upper-class recruit Pip Thompson who decides to stay in the ranks because he has do-gooding ambitions to teach the lads folk music rather than pop. In the end he is defeated by the system and becomes an officer himself.

A common dilemma in Wesker's plays is the choice between idealism and compromise; to his mind modern society forces compromise and the adoption of the second-best on

its citizens. Wesker spent much of his time, energy and personal income in setting up Centre 42, an idealistic if ultimately unsuccessful venture to bring culture to the masses with popular festivals of the arts. One of Centre 42's first theatrical productions was *Enter Solly Gold* by another East End Jewish playwright Bernard Kops (*The Hamlet of Stepney Green*). Although Wesker's first love story *The Four Seasons* went over poorly, *The Friends* shows a maturing of style.

In the revival of the British theatre in 1956 Theatre Workshop was a major force, thanks largely to the dynamism and freewheeling exuberance of the strident little woman who began it, Joan Littlewood. To see her strutting round the stage at a rehearsal, dragging heavily at the inevitable cigarette, briskly throwing out orders, suggestions and Anglo-Saxon words, was to see an incredible creative spark at work. More than any other director Joan Littlewood *made* other people's plays by getting actors, designers and writers together so that they trigger one another off. Some plays were evolved almost entirely on stage. It was glorious improvisation, 'doing your own thing' before that notion ever became crystallized in words. The musical *Fings Ain't Wot They Used T'Be*, with words by Frankie Norman, a one-time Barnardo boy, and music by Lionel Bart, was very much a group creation with Littlewood editing the production so as to sharpen and tighten it.

Born during the First World War, Joan Littlewood was a London orphan who ran away from her convent school at sixteen and won a scholarship to the Royal Academy of Dramatic Art. Tiring of well-mannered drawing-room plays she turned her footsteps north to Manchester with, so legend has it, a mere 2*d*. in her pocket; there she formed the Theatre Union, and from the beginning she was politically committed. Her interest was the people plays for the Welsh miners and for striking cotton-workers—with sometimes a passionate political intrusion on stage by Littlewood herself. These were the hungry thirties. For a while she was married to folk-singer Ewan MacColl, who supplied some

of the political plays she put on. After the war she started Theatre Workshop, touring Britain and the Continent with a lorryload of enthusiasts who shared the receipts equally. In 1955 she arrived at the Theatre Royal, Stratford. The following year, on 24th May, just sixteen days after 'Look Back' had opened at the Royal Court, the Workshop brought another dose of theatrical excitement to London with the opening of Irishman Brendan Behan's raw and ribald story of prison life *The Quare Fellow*. The boozy, roistering Behan, destined to die of alcoholism within a decade, thought up some of his best lines in the pub opposite. In typical fashion the whole brilliant bibulous outpouring was remodelled by Littlewood, as was Behan's second play *The Hostage*, a tragi-comedy about the IRA and a British soldier being held hostage in a run-down brothel. Both plays were partly autobiographical, Behan himself having spent some time in British prisons for IRA involvements of a characteristically farcical nature. The list of Littlewood successes transferred to the commercial theatre is impressive: Behan's plays, Delaney's play, Stephen Lewis's steamy slice of Stepney life, *Sparrers Can't Sing*, Wolf Mankowitz's musical *Make Me an Offer*. She may also claim with 'Fings' to have launched Lionel Bart as Britain's No. 1 writer of musicals —even though she did quit in a headline-making row as director of his unsuccessful *Twang!*

Though West End transfers were necessary to subsidize Theatre Workshop Joan Littlewood hated the commercial pressures which forced her to break up the cameraderie of her tight-knit company. She left the Workshop in 1961, came back again, and virtually wrote her greatest hit *Oh What a Lovely War* (1963), the musical which uses all the old songs of the First World War with savage pathos to illustrate the wanton waste of that conflict. She left again, full of Third World fervour, to start a theatre centre in Tunisia, and came back to launch the more publicized musical *Mrs Wilson's Diary* (1967), based on the satirical *Private Eye* feature about the then residents of No. 10 Downing Street. Each time shortage of money has forced her to

quit, and in her bargaining with the Arts Council she has not done as well as many others, but somehow Theatre Workshop always bobs up again.

Perhaps the most interesting—if only because he is one of the most difficult to fathom -of today's British playwrights is Harold Pinter. Born in 1930 he is, like Wesker, the son of an East End Jewish tailor. He won a scholarship to the local Hackney grammar school and was involved in pre-war fights with Fascists who were on the march in East London at that time. As a conscientious objector he refused military service and then, after a spell at drama school, he became a repertory actor for ten years under the name of David Baron. He filled in periods of 'resting' as a caretaker, street salesman and doorkeeper at a dance hall. He also wrote a good deal of verse in the style of Dylan Thomas. Then in the mid fifties the Theatre of the Absurd came to London with Peter Hall's production of Samuel Beckett's ambiguous play *Waiting for Godot.* It had a big influence on Pinter.

Frustration, futility, yearning, hidden menace, ambiguity, conversation by *non sequitur* with long pauses, nothing meaning quite what it seems, the real meaning, if there is one, hidden below the overt words and actions, the irrational, indeed absurd, nature of existence . . . all these are common themes in the Theatre of the Absurd and very much hallmarks of Pinter's plays, to the extent that a long, throbbing silence between two people is often called Pinterish. His conversation is often Pinterish in style. 'I hate to sound like Pinter,' he once said, 'but I do feel it's in the silences that I'm moved.'

In television plays at least, where one is paid by the time rather than the line, that cannot be all bad. He wrote his first short play, *The Room*, in only four days for a student production, and found the experience of seeing his work on stage so stimulating that he at once started to write his first full-length play, *The Birthday Party.* This was followed two years later, in 1960, with his first big commercial success, *The Caretaker. The Room* is very typically Pinterish,

reflecting his obsession with the enclosed space. An elderly couple, Mr and Mrs Hudd, live in a room which represents security and comfort to her (note the womb-like connotations of the room), but their existence is disturbed by a series of visitors, including a blind Negro, whose weird, disjointed remarks build up an atmosphere of menace. There is more hidden menace in *The Dumb Waiter*, in which two gunmen, Ben and Gus, apparently waiting for orders to kill, sit in a room with a dumb-waiter which comes up with a series of lunatic orders for food. Gus leaves the room and up comes a message for Ben: to kill the next man who enters. It is Gus.

In *The Birthday Party* Stanley, who is fortyish, is lodging in a seaside boarding-house with an old couple when a talkative Jew called Goldberg and a sinister Irishman called McGann invade his room and proceed to subject him to a terrifying cross-examination concerning a crime or crimes which are never quite specified. One question is 'Who watered the wicket at Melbourne?' (Pinter is a fanatical cricket fan.) In the German translation this has been rendered: 'Who peed against the city gates of Melbourne?' No doubt the translator looked up wicket, found 'wicket-gate', and did the best he could with a typically mysterious bit of Pinter dialogue. And who knows, perhaps this rendering will do as well as any other. Goldberg and McCann, as the final humiliation, arrange a mock birthday party for Stanley before taking him away in a brainwashed hysterical torpor.

All manner of symbolism may be read into these plays, although Pinter himself usually denies any such significance. He will not be drawn about his meaning or his sources. He covers his tracks too well. He delivers no moralizing and crusades under no banner, like a Wesker or an Osborne. He was once asked at a writers' brains trust: 'But what would you say your plays are about, Mr Pinter?', to which he replied, 'The weasel under the cocktail cabinet.'[3] And to that he has unashamedly added: 'If I'm being more

3. John Russell Taylor, *Anger and After*. Methuen, 1969 edn.; page 323.

explicit then I'm failing. All I try to do is shape a dramatic image and leave it at that. I don't see life as explicit. It's too complicated for that.' Of course the *non sequitur* and frequent repetition to be found in Pinter's work are a perfectly true echo of conversation in real life.

Though *The Birthday Party* had no great success when first staged in London in 1958, it was later produced on television to a large audience, as was another Pinter play, *A Night Out*, about a son's attempts to escape just for once the clutches of his fiercely possessive mother so that he can have a night out. The audience rating was some sixteen millions, thereby demonstrating that, for all his difficulty, Pinter can appeal to a mass audience. Television successes paved the way for the long-running West End success of Pinter's next play *The Caretaker* (1960), in which Pinter himself appeared for a while as one of the actors. *The Caretaker* is, in Pinter's own phrase, 'about three people in a room'—two brothers, Mick and Aston, and a wily old tramp of uncertain origin called Davies, who wants to foist himself onto the home and is promised a job as a caretaker. This is more a psychological comedy than the 'comedies of menace' which preceded it Several of Pinter's works began life as television and radio plays, but were later staged in the early sixties, including *A Slight Ache*, *The Dwarfs* and two husband and wife plays *The Collection* and *The Lover*. Here the husband and wife play elaborate games. He most respectably goes to work in the morning. She prepares for the visit of her lover. When he arrives he turns out to be the husband in disguise. Married couples need these games, Pinter seems to be saying. Inside every respectable wife is an intelligent woman or a voluptuous tart trying to get out. We all of us are so many things to different people and to ourselves.

The Homecoming (1964), tightly written and compact, won four Tony awards in America for Broadway's best achievements, including a prize for director Peter Hall.

Pinter waited six years before producing his next play of mood and menace, *Old Times*—story of a love triangle

with a difference. Anna, a sly lady who has settled in Sicily, visits her old flat mate Kate, now living in an English seaside farmhouse with her film director husband Deeley. Husband would appear to be odd man out for at some time in the past Kate 'shy as a fawn' and the more forceful Anna have, it seems, been lovers. The scene moves to the bedroom where Anna and Deeley emerge as rivals for the withdrawn Kate. Deeley is moved to explosions of wrath before lapsing into baffled defeat. It was hard to believe that Pinter was breaking new territory—and yet he still provokes and teases the mind more than any other playwright living.

Pinter is obsessed with cricket, lives not far from Lord's at Regent's Park and takes regular net practice with his son Daniel from such experts as Alf Gover, the old Surrey and England fast bowler, and Arthur Wellard, seam bowler and mighty hitter of sixes who used to play for Somerset. Pinter, dark and lean, turns out regularly for a local Surrey side. Perhaps with coaching as a youngster he could have been a real good 'un. 'When I hit a six I think I am happier about that than almost anything that's happened in my life. It is more stimulating than a good notice.'[4] Worldly success means little to him.

Light on plot but deep in characterization are the bizarre North Country farces of Henry Livings, an expert cook (shades of Wesker) who also spent his National Service in the RAF. *Stop It, Whoever You Are* features one William Perkin Warbeck, a miserable little worm of a man, whose job as a lavatory attendant lands him in a series of unbelievable disasters (well, not all disasters: he is vamped by the local Lolita), culminating in his death and return by séance to get his own back on earthlings who have displeased him, in particular his dreadful wife. In *Nil Carborundum* Livings uses his RAF experience to satirize peacetime service in a long series of farcical episodes.

Livings has written for television and it has been a fruitful nursery for many new playwrights, including David Mercer (*A Suitable Case for Treatment*, later filmed as

4. The *Evening Standard*, 21st August 1970.

Morgan). David Rudkin has also written for television, but his main achievement was a play produced by the Royal Shakespeare Company *Afore Night Come* (1962), a sinister rustic parable, with the doom-fraught overtones of Thomas Hardy, about the ritual murder of an innocent Irish tramp by a group of fruit-pickers. He is killed because he is different, a foreigner, who rouses superstitious fears.

Another television dramatist, Welshman Alun Owen, was brought up in Liverpool and collaborated with Lionel Bart in the musical *Maggie May* (1964), a colourful romantic tale of a Liverpool tart. As might be expected from one who comes from Liverpool, city of Protestants and Catholics, religious conflict is a strong theme in Owen's plays, notably *The Rough and Ready Lot* (1958) and *Progress to the Park* (1958).

Barrister-playwright John Mortimer, ex-husband of novelist Penelope Mortimer, wrote his first, short play, *The Dock Brief*, in 1957 for radio. In this a man who has murdered his wife is defended by an elderly and incompetent barrister who has wild delusions that he can organize a brilliant defence. In court it comes to naught: the barrister is incapable of even opening his mouth. In view of the totally inadequate defence the judge decides to let the murderer off, and the freed prisoner then praises the barrister for a supposedly master-stroke of tactics. Illusions are preserved. Pride is saved. Mortimer uses his comedy for serious purposes—in defence, as he puts it, of 'the lonely, the neglected, the unsuccessful'. *What Shall we tell Caroline?* (1958) and *The Wrong Side of the Park* (1960) both revolve round the eternal love (or hate) triangle.

The stage has been a potent force in shaping television drama, and vice versa. A Canadian, Sydney Newman, has been responsible more than any other for introducing writers like Pinter, Owen and Clive Exton to the television screen. Newman was with the commercial channel before heading the BBC's Drama Group.

Willis Hall made his name with a raw, angry play about British soldiers in the Malayan jungle, *The Long and The*

Short and The Tall. He collaborated with journalist-novelist Keith Waterhouse to dramatize the Waterhouse novel *Billy Liar* about a North Country lad with a compulsion to fantasize especially about women—later an excellent film starring Tom Courtenay.

Tom Stoppard, a West Country journalist turned TV playwright, was glad of any job that paid the rent until the National Theatre staged *Rosencrantz and Guildenstern Are Dead* in the spring of 1967. It was a stunning overnight success. Stoppard, only twenty-nine at the time, became the youngest living playwright to have a play in the National repertoire. In semi-comic vein the play supplied the missing piece from Shakespeare—whatever happened to Rosencrantz and Guildenstern, Hamlet's shadowy cronies from his university days, when they went to England from Elsinore? Little men helpless in a great tide of events, they exchange an uneasy and bewildered cross-talk about the meaning of their lives and their likely future. 'The situation is essentially humorous—two guys waiting for something to happen. But the play is, I think, something more than a giggle,' is Stoppard's own summing up. Translated into more than twenty languages, 'R & G' was also the winner of Broadway's Tony award for the best play of the 1967–8 season.

Peter Nichols, an ex-school teacher, had his first big success with *A Day in The Death of Joe Egg* (1967), on the face of it a dangerous slice of autobiography to handle, for it is a comedy about his own spastic child and the effect on the child's parents. Nichols has a remarkable gift for extracting comedy from suffering as in his play *The National Health*, where six ageing male patients dissect their troubles in a grim hospital ward. Nichol's comedy *Forget-Me-Not Lane* (1971), which harks back nostalgically to the war years, probes the thoughts of a restive middle-aged husband haunted by the vision of his wife as a youthful sexpot rather than the nagging mother she has now become. It has confirmed his growing reputation.

One of the paradoxes of the lively British drama of today

is that the commercial theatre itself is very much in the doldrums. In its report 'Theatre Today' the Arts Council describes a frightening drop in the number of commercial theatres. In 1970 there were only about seventy, of which forty are in London. Forty years ago London had about the same number as now and with its large catchment area and growing number of foreign tourists will doubtless maintain this. But in the provinces the 130 commercial theatres of forty years ago have dwindled to only thirty. Television rather than the cinema has been the main cause. Yet side by side with this decline of the commercial theatre has been a rise in the number of provincial theatres subsidized by the Arts Council. There are now almost sixty subsidized repertory companies outside London and in the past decade twenty new theatres have been built. They are exciting places. Indeed as the commercial theatre grows more and more nervous either it grabs desperately at the sort of shock sex play which the ending of the Lord Chamberlain's censorship has made possible or else it turns to re-runs of the old and well-tried faithfuls. So the subsidized theatre, with usually a modest involvement by the local authority, is providing most of the dynamism and new ideas. To the Arts Council it is 'a convincing illustration of the merits of public subsidy as a fertilizer'.[5]

An out-of-town trial run at Arts Council expense has resulted in many significant new plays and productions coming to London. Peter Luke's *Hadrian VII*, the dramatized version of the novel by Baron Corvo (pseudonym of Frederick Rolfe), came from Birmingham, the Bristol Old Vic pioneered Iris Murdoch's plays and Barry England's long-running *Conduct Unbecoming*. The successful Chichester production of Robert Bolt's *Vivat! Vivat Regina!*, paved the way for its transfer to the West End. The Oxford and Nottingham Playhouses and the Coventry Belgrade Theatre have also sent important contributions to the London stage.

In London there are five subsidized theatres (or seven if

5. *The Theatre Today in England and Wales.* Report of the Arts Council Theatre Enquiry, 1970; page 35.

you count Sadler's Wells at the Coliseum and Covent Garden). The Old Vic[6] and the sparkling new Young Vic form part of the National Theatre under the direction of Sir Laurence Olivier. The other three are the Mermaid, the Royal Court and the Royal Shakespeare Company's London theatre at the Aldwych.

The Mermaid, down by the quaintly named Puddle Dock overlooking the Thames in the City of London, has prospered under the lively and buccaneering direction of Sir Bernard Miles, actor, manager, director and one-time music-hall comedian with a rustic and rather blue act. Sir Bernard's choice has ranged from the Goons to Euripides, and his big successes have included *Hadrian VII* and *Lock Up Your Daughters* (a musical based on Henry Fielding's play *Rape Upon Rape*).

The Royal Court under George Devine's successor William Gaskill seemed for a while to be producing more rows than good drama, including a rather peevish ding-dong with the critics over their almost universal crucifixion of Gaskill's unusual production of *Macbeth*. But 1970, despite another row with the critics, was a vintage year at the Royal Court, the greatest the English Stage Company has enjoyed since it began in 1956. For instance, it scooped four out of five of the *Evening Standard*'s Drama awards, and brought to the fore two youngish playwrights of considerable talent. Christopher Hampton's witty *The Philanthropist*, about a diffident don who tries too hard to please, won the best comedy of the year award. The best play of the year award went to *Home* by David Storey, a Yorkshire-born novelist of some reckoning who was once a professional Rugby League player and wrote a novel round his experience called *This Sporting Life*. Storey's enigmatic *Home*, about the inmates of a lunatic asylum, also won the best actor of the year award for those two stalwart acting knights, Sir John Gielgud and Sir Ralph Richardson, who starred in it in London and on Broadway. Royal Court ripples spread across the Atlantic again in the

6. Started by Lilian Baylis in 1914 in an old temperance music-hall known as the Royal Victoria Hall.

shape of Edward Bond's controversial play *Saved*, which features the on-stage stoning to death of a baby in its pram by thugs. When it was first staged in 1965 the play offended the susceptibilities of some policemen in the audience. It was prosecuted, given a modest fine—and much publicity. Bond has a sensitive ear and nose for the language and squalor of lower-class life and his talent has been widely acclaimed in America.

The Aldwych Theatre grew out of the Memorial Theatre, Stratford-on-Avon, when Peter Hall became director of the Royal Shakespeare Company in 1960. His ambition was to form a national repertory company of note such as other capital cities enjoy. In ten years the company has averaged a production a month. Some of them have proved enormously popular all over the world, such as Peter Brook's *Marat/Sade* (an extraordinary and harrowing depiction of lunacy on the stage) and his *Midsummer Night's Dream*, which had sensational success on Broadway, with black market tickets going for up to £25 a pair. What with excursions into the Theatre of Cruelty and the Theatre of the Absurd, including Hall's productions of Pinter, the once staid old lady of Stratford has certainly shaken her skirt loose. The Royal Shakespeare's subsidy of £229,000 amounts to less than 23 per cent of total receipts, which is better than the average for most subsidized theatres. Now that the number of tourists to Britain has doubled in six years to over 7 million (of whom 58 per cent visit the theatre during their stay),[7] the trendy RSC must be reckoned a substantial dollar-earner. It has also toured sixteen countries and won forty-eight major national and international awards including eight New York Tonys. Dame Peggy Ashcroft, who has been with the company continuously, has won three Best Actress awards.

With a yearly audience of over a million (compared with 385,000 in 1960) the RSC has a larger audience than any other theatre in the world and three to four times the audience of its rival the National Theatre. According to one quip

7. The *Observer*, 13th December 1970.

this is because many foreigners asking for the Old Vic are understood by taxi-drivers to be asking for the Aldwych. The true success of the RSC lies in its adventurous policy and the new more intimate way in which it presents Shakespeare, a face-to-face confrontation of actor and audience on a comparatively bare stage devoid of the pomp and trappings favoured by the Edwardians.

Peter Hall, son of a Suffolk station-master and one-time husband of Leslie Caron, directed plays at Cambridge as an undergraduate. At twenty-four he was the first man in England to direct *Waiting for Godot*, and took over complete control of the RSC at only twenty-nine, a post he held with brilliance for a decade. Having made the RSC into one of the best classical companies in the world he has now succeeded Lord Olivier as head of the National Theatre. His all-round abilities as director, impresario, negotiator and publicist make him a sound choice for the job.

The founding of the National Theatre in 1963 was the culmination of a dream going back to Garrick in the eighteenth century. Irving championed the cause in the nineteenth century, but progress is always slow in matters that touch the pocket fairly deeply. The tercentenary of Shakespeare's death in 1916 should have seen the building of a Shakespeare Memorial Theatre in London, which would also have served as a national theatre, but the First World War intervened. The Second World War put paid to plans for a national theatre at South Kensington, although a site had been bought. This was swapped for a site on the South Bank after the war, and in 1951, Festival of Britain year, a foundation stone was actually laid. Then in 1963 the National Theatre took over the Old Vic, pending a move to a permanent site on the South Bank in an exciting new theatre designed by Denys Lasdun.

The National Theatre presents Shakespeare, the other English classics, foreign classics, contemporary English plays, contemporary foreign plays and recent plays that deserve revival. It owes much to the popularity of its first

director, Sir Laurence (now Lord) Olivier, who can fairly be called the greatest actor in the world today.

Olivier (born in 1907) is the most versatile of actors, from the punishing role of Othello to a series of modern film parts. He has starred and directed in such notable films as *Henry V* and *Hamlet* and he has acted in virtually every major male Shakespearean role -and one female, having made his formal stage début at fourteen as Katharina in a special boys' performance of *The Taming of the Shrew* at Stratford. Before that his talent had been noted by the great Ellen Terry in a school play when he was only ten. His father, a parson, had been a keen amateur actor with the Oxford University Dramatic Society and he could also turn on the histrionics from the pulpit. He encouraged young Laurence to turn to the stage as a career. Olivier makes no claim to be an intellectual: 'I've never read anything except scripts. That's included a fair bit of Shakespeare, Shaw, Sheridan, Chekhov and others, of course, but outside of that I'm an ignoramus.' In his acting he exploits changes of rhythm to get his effect, altering his speed of speech, his expression, his pace across the stage. 'Keep the audience surprised, shout when they're not expecting it, keep them on their toes—change from minute to minute. Always be anticipating what the audience are expecting and don't do it.'

He finds great parts drain him emotionally. 'If you do it right you do feel it. The suffering, the passion, the bitterness, you've got to feel them. . . . Acting great parts devours you. Great parts are cannibals. It is a dangerous game.' There is also the physical strain. 'I was a weakling. As a child I was a shrimp, as a youth I was a weed. I was nearly forty before I dared appear on the stage in tights without padding my legs.'[8] For years now Olivier has done a three or four times a week stint in a gymnasium, standing on his head or bicycling like mad. As an actor with an enormous range of roles he has done more than anyone to break down the barriers between highbrow and lowbrow. This will be one of the

8. Kenneth Harris, *Talking to: Best of the Kenneth Harris Interviews*. Weidenfeld & Nicolson, 1971.

functions of the National Theatre as it opens on its new site—that and the grooming of young actors who will become the stars of tomorrow. They could not wish for a better example than Laurence Olivier.

The National Theatre Company draws an annual subsidy of £270,000. Overall, theatre in Britain draws from the Arts Council some £2¼ million out of the Council's total yearly budget of over £12 million. The money is given with no strings, just as the Arts Council itself is very much an autonomous body divorced from government control. There is no doubt that its support has been one of the main reasons for making London the theatre capital of the world. But no amount of fertilizer can produce a crop unless the seeds are there in the first place.

Before the advent of the new drama, George Bernard Shaw (1856 1950) was the strongest influence in British theatre. Journalist, Fabian socialist and influential dramatic critic for *The Saturday Review* in the nineties, Shaw came to playwriting with ideas completely different from those that had dominated the theatre hitherto. Not for him the well-made play with its neat story line. Shaw used the theatre as the medium for propagating his iconoclastic ideas. His was the New Drama of its day. He relates how his very first play *Widowers' Houses* started as a romantic sort of play in collaboration with William Archer, but Shaw turned it into 'a grotesquely realistic exposure of slum landlordism' (Archer having by now dropped out). It was a sensation and Shaw became as infamous as any of the 'Angries' of the fifties. *Mrs Warren's Profession*, being the oldest in the world, caused a similar shock and was for many years prevented by censorship from commercial showing. The comedy with a moral, *Arms and the Man* (1894), has been consistently one of his most popular plays. *Man and Superman* (1903) develops Shaw's idea of the Life Force, a power which seeks to raise mankind, given co-operation, to a better existence. The same doctrine appears in *Heartbreak House* (1917), and in his history on the grand scale returning to Adam and Eve, *Back to Methuselah* (1921). He wrote pop-

ular historical drama (*Saint Joan*, 1924) and popular comedy (*Pygmalion*, 1912) which very successfully translated itself into musical and film as *My Fair Lady*. In his fifty-two plays he ran the gamut of subject matter. One cannot always give him full marks for coherence of thought; his work has been described as a chaos of clear ideas. But his influence has been all-pervasive; he propagated the idea that the theatre can and should be a platform of debate. He was a liberating influence because he demonstrated that, given the wit and intelligence, virtually any theme, idea or discussion can be successfully presented on the stage.

Shaw despised the well-made play, but it is by no means dead among modern playwrights. Cautiously experimental and commercially most successful is Robert Bolt (born 1924). The son of a small shop-owner, he worked his way by scholarship to university, served in the RAF, was a school teacher and radio dramatist and scored his first major success with *Flowering Cherry* (1957), the story of a failed suburban man with delusions of success, most ably played by Sir Ralph Richardson. Robert Bolt's biggest triumph has been his play *A Man For All Seasons* (1960), later a film, featuring the troubled conscience of Sir Thomas More as he unhappily confronts his monarch Henry VIII over the split with Rome. Bolt has also turned more than a modest penny from his screenplays for such notable David Lean films as *Lawrence of Arabia* (1962), *Doctor Zhivago* (1965), which won the British Film Academy Award, and more recently the epic *Ryan's Daughter*, an original love story written for Lean and starring Bolt's wife Sarah Miles.

Peter Shaffer (born 1926) is also a traditional playwright in style, and his first major success *Five Finger Exercise* (1958) is set in that traditional heartland of British theatre, the upper-class drawing-room. But the atmosphere of confusion and unease is Shaffer's own. Walter, an enigmatic young German boy, arrives as tutor to the family's daughter. Father is a wealthy no-nonsense type of business man, mother has cultural pretensions and the son is confused and unhappy. Each weaves a web of fantasy round the person of

Walter, seeing him as lover, or second son or close confidant; in short, the remedy for whatever is lacking in their lives. But his presence only draws out explosive emotions of jealousy, rage and frustration. No chintzy drawing-room drama, this one Shaffer followed this with an ambitious spectacular *The Royal Hunt of the Sun*, about the Spanish conquest of the Incas in Peru.

Peter Shaffer's twin brother Anthony, a television and film writer who has sometimes collaborated with Peter on detective novels—they also co-edited *Granta*, the university magazine, when at Cambridge—has produced a world-hit play with *Sleuth*, a whodunit with a difference. *Sleuth*, the story of a half-mad thriller writer, Andrew Wyke, who toys with killing his wife's lover, was a reaction against the well-mannered drawing-room thriller of the Agatha Christie school. 'You know the sort of thing,' Shaffer explains, 'the murdered, the murderer and even the detective were all gents.' Of course Shaffer was conscious of Agatha Christie's success. He read one of her novels and could see its selling point, but he wanted to produce something modern that did not project the image of an England of thirty years ago. The play he wrote is a subtle, sophisticated tease in which the thriller writer Wyke sets out to trap his wife's lover with a variety of games, masks and charades, but succeeds only in trapping himself. At one time the play was running simultaneously in six world capitals—London, New York, Paris, Madrid, Athens and Tel Aviv. It has made for its creator more than a million dollars and launched Tony Shaffer on a profitable film-writing career.

Alongside the experimental dynamism of the new dramatists were the old professionals Coward and Rattigan. In the 1970s there was still room for a bright new revival of Coward's *Blithe Spirit* on the West End stage and for a new production of Rattigan's *The Winslow Boy*, as well as his new play about Lord Nelson and Lady Hamilton called *A Bequest to the Nation*. Sir Noël Coward (1899–1973), was a respectable part of the English theatre for so long that it is something of a shock to recall that when he launched his first

success *The Vortex* in 1925, he was pilloried for writing 'Dustbin Drama'. Certainly for the twenties the themes of drug-taking and a middle-aged woman's love affair with a boy the same age as her son, were shocking for the stage. But Coward, in a *Daily Express* article headlined 'Plays Without Hypocrisy', declared: 'I intend to write as honestly and sincerely as possible. If the public do not like it, they need not come to see it.'

Like Osborne thirty years later he was hailed as the spokesman of the younger generation, and indeed he has been more avant-garde as a playwright that he is usually given credit for. He always believed in the unspoken meaning being as important in a play as the formal words. 'Writing should be suggestive,' he declared. 'Such a mistake to dot all the i's and cross all the t's. It's a question of taste and knowing how to use language.' One can see the technique at work in the celebrated reunion scene between Elyot and Amanda in *Private Lives*, where the divorced couple meet again and rediscover their old love by exchanging travel notes in brittle, clipped, terribly Coward-like tones. The words taken at their face value mean little, but all the while one can feel the tension and emotion rising until Elyot bursts out, 'Darling, darling, I love you so.' For a moment Amanda tries to fend him off, then she has to admit—'No, no doubt anywhere'—that she loves him too.

Coward, the master of high comedy, could always use it to say something serious. Somerset Maugham predicted as early as 1929 that Coward would be the playwright with most influence on other young writers for the stage and that his influence would last for another twenty years. If anything it has lasted longer than that. Pinter, for instance, acknowledges his debt and the admiration was reciprocated. 'Pinter has a superb gift for words,' said Coward.[9]

Coward's favourite theme was the romantic triangle. In *Design for Living* there are two men and one woman, in *Blithe Spirit* (1941), one man with two wives, one of whom died ten years previously, only to reappear and taunt him as

9. *Daily Express*, 21st March 1966.

a beautiful, giggling ghost. In *Present Laughter* the middle-aged actor, Garry Essendine, proceeds from one affair to the next, each being secretly and knowingly arranged by his separated wife Liz to whom, she being the all-wise mother-figure, he eventually returns. Though some Coward plays may seem slight when read, almost invariably they perform well on stage. *Private Lives* (1930) and *Design for Living* (1932) were both revived in America in 1970, where one critic delivered the verdict that Coward was 'a premature hippie', to which the master replied in sauve tones: 'I think it is a compliment, except that I was fairly clean. I wash myself a great deal.'

Coward's contribution as a popular song-writer has the same evergreen quality. *On with the Dance* and romantic musicals like *Bitter Sweet* (1929) still stand up musically. It is easy to spoof the words and music of 'Some Day I'll Find You', yet the potency of 'cheap music' (to use Coward's own phrase) is undeniable. He also produced patriotic drama in *Cavalcade* (1931), and during the Second World War *This Happy Breed* and the celebrated film about the Navy *In Which We Serve*, made with the aid of his friend Admiral Lord 'Dickie' Mountbatten Coward himself played the role of the Mountbatten-like skipper in the film. As an actor he spanned sixty years, having first appeared at the age of ten. His first screen role was again as a child, in D. W. Griffith's *Hearts of the World* in 1911.

There followed scores of successful roles on stage and in cabaret. He wrote some of the crispest satirical lyrics in the business, like 'The Stately Homes of England' and 'Mad Dogs and Englishmen'. He has also written serious drama, most notably *Waiting in the Wings* (1960), set in a home for old actresses, and *A Song At Twilight* in which the theme is the homosexuality of a celebrated old writer. The Grand Old Mandarin of the English theatre himself, all lean and leathery, played the lead role when the play first came to the London stage in 1966.

Terence Rattigan (born 1911) was only twenty-five when he scored his first spectacular success with his comedy

French Without Tears, which had a run of 1,049 performances. It is a super-light but most cunningly devised comedy - four men cramming French on the Riviera, and their various flirtations with the sister of one of the men, and a pretty French girl. Rattigan's war-time play *Flare Path* was written after 400 operational hours as an air gunner with the RAF; it was a good patriotic piece for the times and revolved around the problems and anxieties of the fliers' girl friends.

While the Sun Shines was another war-time play, an ephemeral farce, to be honest. A Free French officer, an American officer and an ordinary seaman who is a duke all share the same flat and get into a tangle over the duke's fiancée. But as ephemeral farces go it went very well—1,154 performances in all. After the war Rattigan wrote his plays of real stature: *The Winslow Boy*, reconstructing the famous Archer-Shee case of 1908 in which a cadet at Dartmouth is wrongly accused of stealing 5*s*.; *The Browning Version*, a portrait of a disillusioned schoolmaster hated by his form who is finally thawed by a touching gift from a small boy—a copy of Browning's translation of the Agamemnon of Aeschylus; *The Deep Blue Sea*, story of a suicidal married woman torn between husband and lover; *Separate Tables*, two one-act plays in a seaside hotel, with faded spinster and ne'er-do-well military man; *Ross* (1960), the dramatized career of Lawrence of Arabia; and *Man and Boy*, in which a Greek financier, facing ruin, tries to use his son as bait to trap a business rival whom he knows to be a homosexual. Rattigan once said that he wrote his plays for Aunt Edna, his image of the typical playgoer. If Aunt Edna never complains, the critics have. They tired of the well-made play which spelled its story out too openly. Yet a deep and serious mood has affected much of Rattigan's work; humiliation is a common theme. He has always regretted that he was not taken more seriously, feeling he would have done better to be born into the Victorian world of Henry Arthur Jones and Pinero. 'My great ambition is to have been born a hundred years earlier and to have written a great play.' And yet the

best of Rattigan's work will stand revival and give enjoyment many years hence.

There was a fairly transient vogue for modern verse drama in the forties and fifties with the romantic plays of Christopher Fry (*The Lady's Not for Burning*), but it took the 'Angries' to provide the real leaven for the new drama. Will there be another leavening influence in the seventies? Or do we perhaps now have the best of both worlds, with a theatre that is part commercial, part subsidized? One could not exist long without the other. Subsidized drama adds its dynamism and prestige, but without the Rattigans to fill the commercial theatre drama in Britain could hardly survive.

Chapter 45

SCULPTURE AND PAINTING

One of Henry Moore's daily helps in his younger days once said: 'Poor Mr Moore! There 'e goes 'ammer, 'ammer, 'ammer all day at the bottom of the garden, and what 'as 'e got at the end of it? Nothink. Only 'oles.'

The world these days is generally more respectful of Henry Moore and his Holes. A miner's son from Castleford in Yorkshire, seventh out of eight children, he is now the world's most highly regarded and expensive sculptor. A pen-and-ink drawing by Moore fetched over £8,000 in 1969. A small Moore bronze, of which there may be seven or eight casts, sells for over £10,000. One of his major reclining figures has changed hands at £70,000. In some years exports of his work may earn Britain up to £1 million pounds in foreign currency. Moore himself says he's astonished by the prices paid for his work 'It's only happened in the last ten years, a little bit embarrassing. But I hate talking about money.' As a young art teacher on a visit to Paris he had to count every centime in a place where he would now be courted by the wealthy and famous. Even as late as 1941, when he and his wife Irina were bombed out of their Hampstead home, they were glad of just £300. This was the down payment needed for the fifteenth-century white-walled cottage called Hoglands in the hamlet of Perry Green near Much Hadham in Hertfordshire, which is still Moore's home and studio. It is a thirty-mile drive north from London to gently rolling hills – very different from the jagged, slag-heap cratered Yorkshire landscape of Moore's youth. It was once two labourers' cottages and very decrepit. The owner wanted £900 for an outright sale, but even the down payment seemed beyond Moore, until a cheque arrived at the last moment offering £300 for his famous 'Detroit Reclining

Figure' in elmwood. 'Thanks to that sculpture we are sitting here now,' said Moore. 'For me it was a priceless sale', and he adds without bitterness that the same reclining figure sold to the Detroit Institute of Arts for about a hundred times what he was paid. We were talking in his drawing-room full of art treasures. Between us was a table loaded with pebbles, shells, and cacti. His hands were perpetually busy fingering the odd shapes and twisting a piece of wire with beads on it. For a sculptor hands are a second pair of eyes.

He pays top surtax rates and could be a very much wealthier man if he chose to move out of Britain. But he will not. 'If I have to pay a lot of tax I am happy to do so I love England and it would take me years to re-create the atmosphere I have here at Hoglands.'

The 'Detroit Reclining Figure' is a typical piece of Moore, in which chest, breast and Cyclopean head are pierced by holes so that the entire piece is a seductive convolution of tunnels and entrances. The Hole is Moore's special trade mark. He was not the first sculptor to use it: his heroes Michelangelo and Rodin both used natural spaces in postures of the human form, such as the crook of the arm. But Moore used the hole aggressively and unnaturally, drilling it right through the body. 'The first hole through a piece of stone is a revelation,' he says, and talks in poetic vein of the 'mystery of the hole—the mysterious fascination of caves in hillsides and cliffs'. He says too that 'by making holes through a block you can relate the front to the back'. You can also heighten the three-dimensional effect—'that absolute, three-dimensional existence which is the object of sculpture.'

Moore's father was a determined, self-educated man, stern and Victorian in outlook and avid for self-improvement. When a pit injury stopped his promotion he channelled all his ambitions into the lives of his children. Young Henry, who was born in 1898, had decided to be a sculptor from the age of ten when he first heard his Sunday school teacher talk about a sculptor called Michelangelo. His earliest com-

mission was as a schoolboy, when he carved in wood the school's roll of honour for those boys at Castleford Grammar School who had fought in the 1914–18 war. Moore fought in the same war, surviving the Battle of Cambrai, much of which he spent in a shell-hole in no man's land. After the war he got a serviceman's grant to study at Leeds School of Art. It was this experience he claims, half-jocularly, that was responsible for nearly all his sculptures being of the female rather than the male form. 'In my first year at Leeds we had an Italian professional male model with a huge waxed moustache. Even from behind the moustache stuck out. I grew sick of drawing him and the moustache for three days a week, morning and night, for the whole year. I remember my excitement when a female model turned up at the School of Art for the second year.'

In fact his preoccupation with the female form, which he shares with Degas, Renoir and numerous others, goes rather deeper than this. 'Temperamentally as an artist I should perhaps prefer the male form because I like hardness in drawings and sculptures, but you need to feel emotional about a form before you can do anything with it and the fact is that I feel more emotional about the female form than I do about the male.' Just occasionally he does a male form, such as the 'Warrior With Shield'. 'But even the fallen warrior has a touch of the feminine about it', he concedes. Conversely Michelangelo—'I think it's generally agreed he was a homo'—preferred the male form. 'As a sculptor you must have a deep feeling and appreciation of the sexuality of the human form and of the difference between the sexes, otherwise you wouldn't use the human body.' He adds that whereas his father rather frightened him, his devotion to his mother was intense. She was a sturdy, handsome woman of forty when she had Moore. Sometimes, when she suffered from rheumatism, Henry would be deputed to rub liniment into her back. He got to know its contours like a piece of his favourite sculpture. 'Most boys have a sort of mother complex. D. H. Lawrence had a mother obsession,' he said, mentioning one of his favourite novelists. 'Even so, it takes

more than a mother obsession to create a sculptor—or a novelist.'

The psychologist Erich Neumann, one of Jung's disciples, sent Moore a book he'd written, *The Archetypal World of Henry Moore*, but Moore stopped reading it after the first chapter. 'I didn't want to know these so-called deep explanations. I was frightened that if I agreed with Neumann's analysis then I'd start to exaggerate what he said and if I disagreed then I'd try to disprove it. Either way my art would become self-conscious.' Moore believes that to talk too much about his art saps the necessary creative tension. Art, like life, he considers, is made up of conflict and tension, and in the work of all the great artists he admires, Michelangelo, Rembrandt, Cézanne, he finds 'a disturbing element, a distortion, giving evidence of a struggle of some sort'.

His voice is soft, distinctly Yorkshire, rather high-pitched. He is smallish, less than average height, pink-cheeked from years of working in the open and full of restless energy. 'A sculptor is obsessed with the shape of things and he can find his inspiration in any number of shapes.' One of his most famous works, 'The Locking Piece', was inspired by a graveyard of animal bones that Moore discovered while digging the garden on some newly bought land. He was fascinated by the way a joint locked together and worked.

He now has some four hundred yards of lawn stretching down from the back of the house to a newly built studio and a large tent-like structure rather like an aircraft hangar, built from aluminium spars with thick transparent plastic. Moore built this as one of those 'temporary' structures, unlikely ever to be taken down, when he was making a plaster model of his twenty-eight-foot long reclining figure for the Lincoln Center. He had no studio large enough, but the sculpture needed protection from the weather. At the same time he needed to be able to see it from a distance and from all angles. The transparent tent was the answer. The lawn itself has become a sort of private sculpture park of work that Moore wishes to keep or that has just come back from

exhibition. It is dominated by the plaster model of the 'Locking Piece'.

Moore works regularly every day, starting at 9 30 a.m. and going right through the morning. 'Work breeds inspiration, it's not inspiration that breeds work.' He feels unhappy unless he works, perhaps something to do with that tough Yorkshire background, and is inclined to say that youngsters today don't know what hard work is. When he was commuting from Castleford to Leeds School of Art six days a week in the twenties he walked half an hour from his home to the station to catch the 8.10 to Leeds. He usually got home around eleven at night. Then there was homework to do. 'A working and travelling day of sixteen or seventeen hours.' He has three or four assistants working for him at any one time -in all there is a waiting list of twenty who want to put in time under the tutelage of the master before they take up teaching posts. But some find catching the early morning train from Liverpool Street to present themselves at Perry Green at 9 a.m. rather a chore.

This makes Moore impatient. Even on summer holidays at Forte dei Marmi in Italy, where he usually takes his wife and his pretty daughter Mary, Moore spends a good deal of time carving. Their cottage is near the big Henraux quarry and Moore likes to walk around the marble cliffs and select pieces to sculpt much as Michelangelo did four hundred years ago. At one time carving direct on to stone was an article of faith with Moore, his famous doctrine of 'truth to material'. The muscles of his right arm became bigger and stronger than those of the left.

Such was Moore's dedication that when he married his Russian-born wife Irina in 1929 he even took a solid chunk of alabaster in one of their honeymoon suitcases. While honeymooning Moore carved this into a small reclining figure, which he sold for £65. (The same figure was sold at Christie's in the sixties for 5,500 guineas.) Moore spent the early years of their marriage as a part-time teacher. There were no fat cheques to support them when they joined the artists' colony in Hampstead, where Ben Nicholson and his

wife Barbara Hepworth as well as other artists and critics lived. It was then that Irina showed *her* practical mind. If she could not hear the sound of chiselling coming from Moore's small studio she would call: 'Henry, you are not working.' So on those occasions when inspiration was lacking Moore would tap his bench with a mallet while reading a book.

He finds carving very relaxing—almost like knitting. 'One can spend two days carving, and since the basic idea is already in the mind it is largely a matter of execution. It is possible to think of other things while being very pleasurably occupied ' But of course much of his work is in bronze and here it is impossible to work directly in the material. He usually starts with a small maquette about four inches or so high, modelled from clay, wax, plasticine or plaster. With a big sculpture such as the 'Locking Piece', he builds up stage by stage. From the maquette his assistants made an armature, a sort of wooden skeleton draped with chicken-wire and filled in with plaster, from which came a three-foot 'Locking Piece', and a bronze cast was made and exhibited. But all the while Moore had intended something bigger, for whereas a small sculpture can be tender, a big sculpture such as a 'Mother and Child' becomes monumental and even terrifying. From the three-foot plaster Moore and his assistants made a nine-foot plaster, slightly changing the proportions, since if you treble the dimensions and multiply the volume twenty-sevenfold a precise blow-up does not *look* the same. Large plasters cannot be cast in one piece, so the plaster is sawn into several sections for casting in hollowed-out bronze. Moore uses a Berlin foundry and the plaster of the giant Lincoln Center figure had to be cut into sixty-five separate pieces. After casting the pieces have then to be welded together.

Moore has been a controversial figure all his life. He rebelled against the classical training at the Leeds School of Art; for him the classical tradition was too perfect and lifeless. When he won a scholarship to the Royal College of Art in the twenties his greatest inspiration came from his visits to

the British Museum, where he was struck by the primitive vitality of the early alien sculptures—Mexican, Sumerian, Egyptian, Negro and North American Indian. His Leeds 'Reclining Figure' of 1929, a solid, vital mass of stone in which the crook in the arm foreshadows the famous Holes, bears a strong resemblance to the Chacmool, a rain-spirit of ancient Mexico.

There followed a succession of mother and child figures—an obsessive theme with Moore. He also began to use the small head on the large body, giving the paradoxical explanation 'because I think the head is so important I reduce it in size to make the rest more monumental'. His first show at the Leicester Galleries in 1931 provoked a storm. As late as 1938 the then director of the Tate, J. B. Manson, banned his work. As a result Moore had to resign from his teaching job at the Royal College of Art, lest he pervert the young with his monstrous ideas. At such a time he leaned heavily on the support and encouragement of friends and critics whose judgment he admired. It was not until the war years that the British public took Moore, at least partly, to their hearts. First there was the Battle of Britain, then came the night blitzes on London in September and October 1940. Travelling home to Hampstead by tube one night Moore discovered that thousands of Londoners were sleeping on the platforms. Later when the train stopped running the current would be switched off and they even made beds between the rails. The rows and rows of figures obsessed Moore. Materials for sculpturing were scarce so he began to draw the huddled masses. 'It was like the hold of a slave ship on its way from Africa to America.' The shelter drawings made him famous round the world.

As his income increased and he was able to afford the materials Moore indulged his preference for working in bigger and bigger dimensions. His marble reclining figure for the UNESCO building in Paris weighs twenty tons and it is sixteen feet long. Moore is a colossus who favours the monumental. He is at once a modest and a proud man. When in the fifties he was offered a knighthood he turned it

down on the grounds that he could not stand the thought of being greeted by his assistants each day with 'Good morning, Sir Henry'. Yet he is supremely confident of his power and ability; although he takes care not to show it he does think of himself as the greatest sculptor alive and his great 1972 exhibition in Florence was proof. There are murmurs from the younger sculptors that Moore has progressed only in size since the war, but he still remains the greatest artist this country has produced since the days of Constable and Turner.

Before a large parliamentary gathering on his eightieth birthday Sir Winston Churchill glowered at the lined and haggard portrait of himself by Graham Sutherland, presented by an all-party parliamentary committee. With a bare smile and a growl he gave his deliberately ambiguous verdict: 'It is a great example of modern art. It certainly combines force and candour.' The painting displeased Churchill and it has remained unhung and unseen ever since, although one trusts still intact. 'How are you going to paint me?' he had asked Sutherland at the first sitting. 'As a bulldog or a cherub?' It had been as a bulldog—and a rather ageing one.

Sutherland has often been controversial and provocative, but as a portrait-painter, perhaps the world's most distinguished, he has not only force and candour but enormous penetration of character. He always says of the Churchill portrait that he painted honestly what he saw, just as he did with the portraits of Churchill's two friends, Beaverbrook and Somerset Maugham, and of the German Chancellor Adenauer. His portraits are always critical and searching and he is fascinated by the faces of men of power, seeking to find in them what scars have been left by growing old with years of responsibility and, very often, loneliness. So too with his historic portraits, such as the dual image of Nelson—profile and head-on view, which shows the great sailor tired and gaunt, with none of the usual trappings of the national hero.

Sutherland, born in 1903, was the son of a civil servant and lawyer, who regarded it as unthinkable that his son should follow the precarious career of painter, keen as he

was to do so. For a while he was apprenticed as an engineer, but his maths were bad, he missed classes as often as he could and was politely told that his future in engineering was a poor one. So he went to the Goldsmith School of Art in South London. At that time, 1921, modern art was either unknown or a dirty word in England. The sculptor Epstein was regarded as a dangerous figure; galleries showed only the most traditional of paintings. But Sutherland had seen the exciting developments in foreign art.

A personal turning-point came when he visited Wales and was fascinated by the bare structure of the land. Sutherland imposed his own personal vision, transforming it in colour and form. His rural scenes find hidden forces of mystery and savagery in the Celtic twilight of the woods, with their massed foliage and gnarled tree trunks. His grotesque landscapes owe a debt to the nineteenth-century 'naturalist' painter Samuel Palmer, whose visionary landscapes had in turn been influenced by William Blake.

Sutherland considers the ability to be bored with his work is important because this means an attitude of self-criticism which can very often lead to new directions. 'In my life I have made several changes of style. I do not know what sets me off. I am under some sort of compulsion.' Some of Sutherland's finest work is to be found in the immense and moving ecclesiastical works such as the vast seventy-foot altar tapestry for Coventry Cathedral. Memorable too is the large vermilion Crucifixion canvas for the Roman Catholic Church of St Aidan's at Acton.

Francis Bacon (born 1909) has emerged since the war as a painter of international repute, a tremendously skilled and inspired user of oil paint. He depicts some of the horrors of twentieth-century living and expresses the solitude and lostness of humanity. Bacon has had numerous international exhibitions, most notably the one in 1971 at the Grand Palais in Paris—an exceptional honour from the French artistic establishment accorded before only to Picasso. Bacon's paintings are now to be found in museums and art galleries all over the world, and numerous are the prizes he has won.

Anthony Caro (born 1924) has plenty of admirers on both sides of the Atlantic. A former assistant to Henry Moore, he has gone far beyond Moore in experimenting with new materials and techniques. His work is totally abstract and non-figurative. Steel plates, rods, aluminium, spars and hefty girders are juxtaposed, bolted together and usually brightly painted. His spaces are vast and open, and it is possible to walk through a Caro sculpture as well as round it. American critics have called him the best sculptor in the world and 'the best English artist since Turner', a description we would prefer to reserve for Henry Moore.

Like Henry Moore, Barbara Hepworth is a product of the West Riding of Yorkshire. 'All my early memories are forms and shapes and textures. Moving through and over the West Riding landscape with my father in his car, the hills were sculptures and the roads defined the form.' She conjures up a wonderful Thomas Hardyish vision: 'On the lonely hills a human figure has the vitality and poignancy of all man's struggles in this universe.' At the age of fifteen she made up her mind she would be a sculptor. At the Leeds School of Art she first met Henry Moore, and the similarity of their work is obvious. A travelling scholarship to Italy opened her eyes 'basking in the new bright light and the new idea of form in the sun'.

She had a son by her first marriage and when that broke up met and married Ben Nicholson; both being painters and sculptors 'each was the other's best critic'. Her dedication to her work was intense—even when she had triplets. 'A woman artist is not deprived by cooking and having children, nor by nursing children with measles (even in triplicate).'[1] Her whole life has been characterized by an extreme sensitivity to shape and form. Like Moore she is a disciple of the Hole. It came to her first in 1931 when she was giving the final touches to a torso and suddenly punched a hole through, which seemed to release a new conception of space. She and Ben Nicholson moved to St Ives in Cornwall

1. Barbara Hepworth, *A Pictorial Autobiography*. Adams & Dart, Bath, 1970.

before the war and that has been her home ever since. The war years were hard: running a nursery and being a mother kept her days full: she was able to work only at nights, drawing and making a few maquettes.

It may have been the strain of combining a career and a family that caused the end of her marriage in 1951. By this time her international reputation was growing, but she remained rooted to her beloved St Ives. She was given the freedom of the borough in 1968, and her work is dotted about the area—outside the Guildhall and in the parish churchyard. She has proved that carving in huge blocks of marble and wood is something that a woman can do as well as a man; she is one of the most distinguished sculptors Britain has produced.

Barbara Hepworth's former husband Ben Nicholson, with the austere precision of his work, has had a great reputation as an abstract painter in Britain, as has Victor Pasmore in his later phase. The versatile John Piper, who was a lawyer before he turned to art, has been Romantic painter, poet, scenic artist and official war artist before turning to Abstract painting.

British art is no longer parochial, and among younger women artists Bridget Riley, so-called 'high priestess of Optical Art', has a big international appeal. Her paintings, generally unframed and on white, present an eye-wobbling dazzle of black lines, circles, triangles and check patterns. She calls them 'impersonal statements with an anonymity of surface'. After studying at the Goldsmith School of Art and Royal College of Art she painted landscapes before switching to 'Op Art' in the early sixties. She exhibited very successfully in New York in 1965. Her work, and the whole movement of optical art, she sees as 'something in the air, an electricity which is synonymous with a new mental and emotional feeling in the world'.

The outstanding British painter of the younger generation is Bradford-born David Hockney, son of a clerk, whose flamboyant life-style has sometimes tended to obscure his serious worth as an artist. Hockney is in his thirties, wears

owlish spectacles with heavy black frames on a round rather babyish face. His hair has been dyed blond ever since he watched a commercial on American television which said 'Blonds have more fun in life. You only have one life. Why not lead it blond?' So he went out and dyed his hair at once. Thus it has stayed—a sort of trade mark for the Golden Boy of British Pop Art. Of course 'Pop Art' is an imprecise label. Hockney uses an amalgam of techniques including photo-montage. He paints a brittle picture of modern life, and his trips to California have had a deep influence on his style. In the West Coast paintings he captures the brilliant colours and the exceptional wealth—the deep blue skies, burnished torsos of young men in the swimming-pools and the lavish, often vulgar, interiors.

Hockney went to Bradford Grammar School, where the strict games routine did not suit him at all. Instead he went to the cinema. At sixteen, just as soon as possible after taking his General Certificate of Education, he left school to go to the Bradford College of Art and then to the Royal College of Art. His work has always had frankness and gaiety, and his offbeat, detached attitude to the modern scene suited the mood of youth in the sixties. He leads the international jet-set's sophisticated life, but he still keeps his Yorkshire accent, and remains something of an enigma.

In the international art market London retains its historic pre-eminence; it is still the major centre for a world trade in the fine arts which now exceeds £500 million a year. In the sale-room alone London has a higher turnover than New York and Paris combined. Sotheby's, Christie's and the No. 3 firm Phillips, Son and Neale, whose sale-room activities also embrace such oddities as toy soldier auctions, were all founded in the eighteenth century. They have the kind of world reputation that Lloyd's enjoy. The Marlborough Fine Art, which was started by two British ex-Army privates, has galleries in London, New York and Rome and is a leading influence in the world's modern art market. As with Lloyd's and the City of London this expertise makes a valuable contribution to the country's invisible export earnings.

Chapter 46

THE BRITISH CINEMA

The sixties was the decade when the British cinema went truly international. The world clamoured for British directors, British stars and British films. Partly it was the by-product of the cultural landslide of the late fifties which had already transformed the novel and drama, partly the fact that British pop, with all the impetus given by the Beatles, had given Britain that famous swinging image. British films, albeit a number backed by American cash, were not just winning great critical acclaim. They were box-office too. *Room at the Top,* directed by Jack Clayton, was a pointer to what was to come, and won two Oscars in 1959. By 1960 Hollywood was still fighting the monster television with epics like *Spartacus* and *Exodus*. Thereafter American companies moved to Europe to make their big films, and hired British directors and stars to score some of their biggest successes.

The best and most successful film of 1962 was *Lawrence of Arabia,* directed by David Lean with Peter O'Toole and Sir Alec Guinness. In 1963, while *Cleopatra* was costing more than £30 million and shaking 20th Century Fox to its foundations, Woodfall's *Tom Jones*, made at a fraction of the cost, scooped three Oscars (best picture, best director in Tony Richardson, best screenplay from John Osborne). It went on to break box-office records all over the world. So did the James Bond film *Dr No,* which established Sean Connery as an international star. 1964 saw the brisk no-nonsense charms of Julie Andrews triumph in *Mary Poppins.* Though Warner Bros. excluded her from *My Fair Lady* after she had created the role of Eliza Doolittle on Broadway the film won Oscars for Rex Harrison, and for Cecil Beaton's costume designs. Peter Sellers was a brilliant success in *Dr*

Strangelove (Or How I Learned to Stop Worrying and Love the Bomb).

The Bond film *Goldfinger* again took more money than any other film, and from England too came *The Servant*, *The Pumpkin Eater*, *The Girl With Green Eyes* (an adaptation of Edna O'Brien's novel) and the Beatles' hit musical *A Hard Day's Night*. In 1965 Julie Andrews was the star in *The Sound of Music*. This, with *Gone With the Wind* (Vivien Leigh and Leslie Howard), are the two top money-spinning films of all time. Julie Christie won an Oscar as best actress of the year for her performance in *Darling* and the internationally cast *Dr Zhivago*, both of which were directed by Englishmen, John Schlesinger and David Lean respectively. From England too came *The Knack*, *Repulsion* and *The Spy Who Came in From the Cold*. In 1966 David Lean's *The Bridge on the River Kwai* was sold to American television for a record £700,000, and was watched by an estimated audience of 60 million. Robert Bolt's *A Man for All Seasons* received an Oscar for the best film as did its star Paul Scofield.

The year 1968 saw Nicol Williamson re-create his stage role of the Osborne play *Inadmissible Evidence*. Later he also staked a claim as 'the world's best Hamlet' on stage and film, at least that was what Prime Minister Harold Wilson was to tell President Nixon. Under the subtle direction of Carol Reed *Oliver!* became a memorable musical. In 1969 Richard Attenborough directed *Oh What a Lovely War*, a stylized presentation of the First World War, which succeeded because of its effective use of song. If *The Battle of Britain* was American financed at least the theme and stars were British.

But 1969 was also the year when the big American film companies found themselves in financial difficulties and withdrew their funds, which had been responsible for more than 80 per cent of British productions. This almost halved the number of films being made in Britain in 1970, and not for the first time the film industry faced heavy unemployment.

At the moment cinema audiences are dwindling not just in Britain but all over the world. Yearly cinema attendances in Britain dropped to around 200 million in 1970, which meant that four-fifths of the audience had been lost in fifteen years. The number of cinemas had fallen to 1,500 in that year compared with 4,000 a decade before. Film rights in likely plays and books are still bought, but most of them are options, and as in the Bible many are called but few are chosen. The day of the big money star who could throw a tantrum because the studio Rolls-Royce was last year's model was now over. The industry, deep in gloom, blamed television. Yet the film is far from dead, although a large part of television output would be if there were no old movies to fall back on. A good film shown in the cinema still draws a large audience; on a Saturday night it is still necessary to queue for a worth-while picture. What has changed is that audiences have become more selective. The name of a big star no longer guarantees attendances, nor is a big budget half as effective as the skills and vision of a good director.

There are many complaints about the system of distribution. The world film market grosses around £500 million a year, of which some 83 per cent goes to exhibitors, distributors and advertisers and only 17 per cent finds its way back into actual production. 'Film production is a mouse which carries an elephant on its back,' complains script-writer Ted Willis[1]. Where the industry in Britain may be criticized is in the rigidity imposed by the two major exhibitors Rank and Associated British Picture Corporation. Their ultra-conventional thinking and reluctance to trade up and take risks with quality films is notorious. On the bleakest estimate one may as well play to empty houses with good films as with bad films. In fact when pictures of the quality of *Charlie Bubbles*, *The Bofors Gun* and Peter Brook's *Lord of the Flies* are finally given a showing they do surprisingly well. The major exhibitors are also, somewhat belatedly, spending

1. The *Sunday Times*, 7th December 1969.

more money on modernizing cinemas and turning them into smaller, more economic units.

Meanwhile among British film-makers there are already signs that the production crisis has been turned into an opportunity. An 80–90 per cent dependence on foreign capital was always dangerous. Now the industry knows it must be cost-conscious again and that it must stand on its own feet. As head of the EMI-Associated British Picture Corporation at Elstree the talented writer/director Bryan Forbes was given a £7 million budget to make twelve films during 1969–71; twelve films for quarter the price of a *Cleopatra*. Not all were successes, but in an industry where four flops for one success is par for the course Forbes had several notable triumphs. There was the award-winning film *The Go-Between*, also two children's films: *Tales of Beatrix Potter* (a ballet version of the famous stories) and an unabashed tear-jerker *The Railway Children*, from the Edwardian book by Edith Nesbit. Lionel Jeffries, better known for his off-beat comedy roles, was chosen by Forbes to direct the film He had never directed a film before, but he had enormous enthusiasm for the book and had picked up more than a few wrinkles after acting in 140 films and under 125 different directors. Making the best of natural settings in Yorkshire the film was produced under budget for only £300,000. Forbes, delighted with the result, saw it as one more item of badly needed family entertainment after what he has called 'the pornography of violence' in films. Forbes is married to actress Nanette Newman, who also starred in his sensitively told story of two cripples who fall in love, *The Raging Moon*. Alas, Forbes departed prematurely from his post at Elstree, just when his quality films began to prove themselves as box office But he remains a film man of vision, with wide experience as actor, director and writer of screen plays. One of his best scripts was *The Angry Silence* (which he co-produced with the star of the picture, Richard Attenborough), a disturbing insight into a trade union's victimization of a worker who does not toe the line. He directed his first film *Whistle Down the Wind* in 1960 and

there followed a long list of award-winning pictures: *The L-Shaped Room*, *Seance on a Wet Afternoon* and *The Whisperers*, which won for Dame Edith Evans a British Academy Award.

Forbes believes there is a big audience for quality and family films. 'All you have got to do is go out and get it.' He adds that 'British directing has never been in stronger demand'. This is certainly true. Today the successful film is more than ever the product of a single-minded director's vision. The super-star system lingers tenuously on, but the presence of a star is not necessary to success. Even mass audiences will go for the name of a director now and never mind if the actors are unknown.

In this new wave of directors British names are prominent, notably John Schlesinger, whose *Midnight Cowboy* wiped the board at the Academy Awards in Hollywood 1970, just as it had done a few weeks previously at the British 'Oscar'-giving ceremony. Characteristically he was not in Hollywood to receive his Oscar, instead he was back in England concentrating with his customary intensity on *Sunday, Bloody Sunday* – a film of unusual brilliance about a middle-aged homosexual (Peter Finch) who loses his bi-sexual boyfriend (Murray Head) to the charms of a divorcee (Glenda Jackson).

Schlesinger, born in 1927 and educated at Uppingham and Oxford, confesses to finding the actual making of a film agony. Only with difficulty, and perhaps never, can a film on the screen be made to live up to his vision of how it *ought* to look. He came to films via television ('Tonight' and 'Monitor') and documentaries. Like his contemporaries, Karel Reisz, Lindsay Anderson and Tony Richardson, Schlesinger owes much to the documentary and to the authenticity of shooting on location. He likes to work away from the studio. 'My main objection to working in a studio is that you tend to get a factory atmosphere . . . besides I like bringing in real people who live in the area where I'm working. I don't think a studio necessarily gives you more

freedom, whereas skilled technicians working on location do have a very real freedom.'[2]

He has an obvious concern for life's emotional bruises, people who have failed because they don't live up to the expectations of those around them, like the compulsive fantasist in *Billy Liar*. This and other films like *A Kind of Loving* and of course *Darling* made him a sought-after director. His film of Hardy's novel *Far from the Madding Crowd* was less well received, but when *Midnight Cowboy* made some sixteen times its cost in its first year of showing Schlesinger was formidably wooed by a spate of Hollywood producers.

It is the hallmark of the new wave of directors that can involve their cast and get them to contribute rather than treating the actors as people who happen simply to be there while a film is being made by someone else. Few directors have got more from their actors than Schlesinger. 'He gets angry if he can't get what he wants,' says Jon Voight, the star discovered by *Midnight Cowboy*. 'He has to find sympathy with the cast. He's always emotionally there.' Schlesinger himself says: 'I was delighted to have discovered Jon Voight, the same delight I felt with Alan Bates in *A Kind of Loving* or Julie Christie in *Darling*. Films are full of constant surprises. You can be testing an actor and after you've mentally rejected him you look at the results on the screen and my God! he's absolutely right for it. We rejected Julie and she came out marvellously. I even rejected Jon Voight! But I was forced to have a second look at him. . . . It's not the initial impact that counts. It's the total sum of the impact - will it last for two hours, or will the audience get bored?'[3]

Lindsay Anderson, a noted stage director, was forty at the time of his first feature film, *This Sporting Life* (1963). The flashback technique in this film is not the easiest to follow, but there is no doubting the moody power of Richard Harris in the role of a very physical Rugby League professional

2 John Schlesinger, 'The New Realism in British Films'. *Society of Film and Television Arts Journal*, Spring 1963.

3. The *Evening News*, 7th April 1970.

football player, who has a despairing affair with his sensuous widow landlady, Rachel Roberts. Anderson's *If* is a rather obsessive exposé of the sadism of public-school life culminating in a revolt of the boys, machine-guns and all. Anderson seemingly regards the school as a microcosm of a society that drives us all to violence as the only solution. 'As an artist you've always got to think of society as your enemy,' he once declared.[4] *If* was made by a comparatively new company, Memorial Enterprises, launched by Albert Finney and Michael Medwin, a cheerful-looking actor and comedian best known for his appearances in television's *The Army Game*. Medwin's urge was 'to make films as we wanted them to be made, not as someone else decided for us'. Finney's own *Charlie Bubbles* had so much trouble to get shown that they might have packed up there and then. But *If* forced its way into the West End and earned good profits. It was followed by *Spring and Port Wine*, the film of a play by Bill Naughton, the novelist who created Alfie, the Cockney Casanova (itself a successful film and book) 'What we must do somehow is to see that all sorts of films, highbrow, middlebrow, and lowbrow, get a look-in,' says Medwin. True to this maxim there came Albert Finney's delightful *Scrooge*, the musical after Dickens.

Peter Yates, after directing the crime film *Bullitt*, is now a major name among international directors. Born in 1929 and educated at Charterhouse, Yates was assistant director to Tony Richardson when he was directing *The Entertainer* and *A Taste of Honey*. His first film as a director in his own right was *Summer Holiday*, with Cliff Richard. *Robbery* in 1966 with Stanley Baker, a film of the Great Train Robbery, came to the notice of Steve McQueen, just then setting up his own film company. He invited Yates to direct *Bullitt*, which Yates did after getting the script completely rewritten. Shooting actually began before the script was finished, and the unfortunate writer was up till the small hours turning out something which could be shot the following day. A lot was improvised. But it worked.

4. The *Observer*, 8th December 1968.

Like Richardson and Schlesinger, Yates believes in shooting on location. *Bullitt*'s exciting car chase up and down the steep hills of San Francisco is one of the most remarkable visual effects ever achieved in the cinema. By contrast *John and Mary*, a love affair between pick-ups, was a completely intimate film. Next Yates took a crew and cast to some inhospitable jungle in Venezuela to shoot *Murphy's War*, and from there to Spain to direct Richard Burton as Don Quixote. Few directors can have made such a name after so few pictures; on the other hand few directors have encompassed such variety. John Boorman, like Yates, transformed a routine police thriller *Point Blank* into a potent parable about the nature of violence. He has followed it with *Hell in the Pacific* and *Leo the Last*. Ken Hughes's *Chitty Chitty Bang Bang* and Ken Annakin's *Those Magnificent Men in Their Flying Machines* were exercises in large-scale jollity—films to take the kids to.

The ability of directors to break away from the obvious commercial mode has given cinema some of its most impressive moments. In *Kes* Ken Loach turns the story of a secondary modern schoolboy in Barnsley and his attachment to a kestrel, which he catches and trains as a hunter, into a kind of social commentary. Loach directed *Cathy Come Home* for television, a film which had a big impact on national attitudes to housing problems, and in the same territory were the films he made from Nell Dunn's books *Up the Junction* and *Poor Cow*, though they lacked the direct emotional impact of 'Cathy'.

Like Schlesinger, Ken Russell came to feature films via television, which has been a major source of talent for the British film industry. Television being a younger industry has less recalcitrant union problems; a director with a television background is used to working on more modest budgets. After *Billion Dollar Brain* Russell turned his talents to the difficult task of filming D. H. Lawrence's *Women in Love*, which despite the opulence of the shooting came in £62,500 under budget for a total a good deal less than £1 million. Lawrence's hatred of the machine and his back-to-nature

beliefs, that the flesh was mightier than the intellect and the phallus mightier than anything, are not the easiest to represent on the screen. Oliver Reed as a mineowner and Alan Bates as a school inspector in the period just after the First World War are the lovers of two animated and all but liberated sisters, played by Glenda Jackson and Jennie Linden. The film just about succeeds because of the pictorial richness of the scenes, from the black malignancy of the Midlands coalfields to the whiteness of the equally lethal ski slopes where one of the men is to die. It succeeded at the box office because of some of the frankest, though most tasteful, sex scenes shot until that time. Glenda Jackson (who in 1974 became only the second British actress after Vivien Leigh to win two Hollywood Oscars, revealed beneath those rather shapeless clothes a surprisingly intense sexuality. This quality was fully exploited in Ken Russell's subsequent film about the life of Tchaikovsky, *The Music Lovers*, in which Miss Jackson as the sex-starved wife of Tchaikovsky sets about seducing her homosexual husband. Mahler was the next musician to receive the sensational Russell treatment. But Russell's controversial film *The Devils*, a debauch of torture and violence among priests and nuns set in seventeenth-century France, seemed to be sensation for sensation's sake.

Of the older school of directors Ronald Neame (*The Horse's Mouth*, *Tunes of Glory*) scored a great success with *The Prime of Miss Jean Brodie*, which brought the best out of Maggie Smith as the eccentric Edinburgh spinster school teacher whose supposedly permissive influence over her pupils is stoutly contested by her adversary Miss Mackay, played by Celia Johnson. The red-haired Maggie Smith, nervous and anxious off stage, is superbly controlled on it. Since joining the National Theatre and playing Desdemona to Olivier's Othello, she has became the foremost actress of her generation in Britain. Her Oscar for Miss Brodie established her international name.

Richard Attenborough, like John Mills, has been in British films for something like three decades, and for years

because of his cherub face he played the part of boy naval ratings (starting with Noël Coward's *In Which We Serve*) as well as the odious Pinkie in Graham Greene's *Brighton Rock*. He was born in 1923, and age has brought maturer roles. His part as the tyrannized worker in *The Angry Silence* (1960) was as harrowing in its way as Brando's role in *On the Water-front*. In 1969 he directed his first film *Oh What a Lovely War*.

David Lean, son of a Quaker family from Croydon, started in films as a tea-boy and number-board boy. Today he is one of the few film directors whom producers will trust with a multimillion pound budget. In recent years Lean has always made epics—and his films have always made money. Yet he never debases standards in order to be commercial. Critics not infrequently sneer, but Lean knows how to touch the emotional heart of his public. All his films show that it is possible to work for a mass audience and respect it at the same time. There is scarcely a film he has directed which is not memorable. The first of these was during the war, co-directing *In Which We Serve* with Noël Coward. The master wrote the screenplays which Lean then directed of *This Happy Breed*, *Blithe Spirit* and *Brief Encounter*, in which Celia Johnson as a happily married mother with two children falls deeply in love with a doctor who is also married. Realizing that the infatuation can only break up their homes they reluctantly agree never to see each other again. *Brief Encounter*, which also starred a youthful-looking Trevor Howard, was the best British film of the decade. After the war Lean directed stark and often frightening versions of *Oliver Twist* and *Great Expectations*. His collaboration with Sam Spiegel won huge audiences for *The Bridge on the River Kwai*, in which Alec Guinness played possibly his greatest film role. As a British officer and prisoner-of-war of the sadistic Japanese, Guinness becomes so obsessed with the bridge he and his men are building for the Japs that he quite forgets he is serving the enemy cause. Lean's *Lawrence of Arabia* was the greatest money-spinner of its year. *Dr Zhivago* earned over £30 million. 'Lawrence' and 'Zhivago'

won thirteen Oscars between them. Both were made from Robert Bolt's screenplay, as was Lean's latest epic the romantic *Ryan's Daughter*, an original love story set in the Ireland of the First World War and the Easter Rising. Lean, for all the barbs from critics, had once again rightly gauged the public taste.

'I would rather make one good picture in three years than make four others in the same time,' says Lean. He is another man bored by the studio and he always shoots on location. He reckons the best year of his life was in the desert making 'Lawrence'. He still feels too much of a European to want to make a film in America. He believes in entertainment to draw people from their television sets rather than frenetic angling after the youth market.

Sir Carol Reed is noted for his thrillers like *Night Train to Munich* and the superb *The Third Man* and *Our Man in Havana*, both created from Graham Greene's scripts; he has directed stories of social misfits (*Odd Man Out* starring James Mason as the fugitive hero). *The Stars Look Down*, in which Michael Redgrave is chained to the coalface for life, was one of the earliest examples of social realism in British films. But Reed is a versatile director, and his unobtrusive craftsmanship was at its best in the film of Lionel Bart's *Oliver!*, which is superior to the stage version not least because of the smooth and spontaneous way in which the music arises out of the action.

The number of pre-war British films which achieved true international recognition probably does not reach double figures. *The Private Life of Henry VIII* (1933) springs immediately to mind, especially Charles Laughton's memorable feast at the dinner-table in which chewed bones are tossed over his shoulder. Sir Alexander Korda, the flamboyant Hungarian producer-director, made it on a modest budget, almost the last time he ever spent modestly. Subsequently explorations of private lives grew more and more expensive. Even Winston Churchill, then in the political wilderness, was hired to write a script. For a while City money poured in, but over-spending and inadequate receipts had their inev-

itable result with the collapse of the British film production boom in 1937. Then, as was to happen thirty-two years later, thousands of technicians became unemployed. Working on a much saner basis with budgets recoverable if need be from the home market, Sir Michael Balcon produced a steady stream of pre-war films from the Gaumont-British Picture Corporation, of which the most remarkable came from the old Cockney master (then a comparatively young master) Alfred Hitchcock. Specially memorable were *Murder*, *The Man Who Knew Too Much*, *The Thirty-Nine Steps* and *The Lady Vanishes*. With the war came the era of J. Arthur Rank and a great upsurge of film production stimulated by war-time conditions when entertainment was deemed essential for morale. There was too the appeal of excellent British documentaries, notably some outstanding blitz films by director Humphrey Jennings (1907–50). But Rank's post-war efforts to make 'prestige' films for the American market lost him much money. Though Rank got the more sophisticated city audiences, with rare exceptions, such as *The Wicked Lady*, which was greatly assisted by a rumpus over the amount of cleavage exhibited by Margaret Lockwood, he could not conquer the American hinterland.

Comedy of course can always be exempted from these strictures, and it was the shrewd head of Sir Michael Balcon (again) who initiated the famous post-war Ealing comedies which started with *Hue and Cry* in 1946 and ended with *The Ladykillers* in 1955. There were *Passport to Pimlico*, *The Man in the White Suit* and *Whisky Galore*. Films like *Kind Hearts and Coronets* and *The Lavender Hill Mob* established Alec Guinness (knighted in 1959) as a major star.

One should also mention the Boulting brothers' satirical farces, Anthony Asquith's successful adaptations of Shaw's *Pygmalion*, Wilde's *The Importance of Being Earnest* and several Rattigan plays; Michael Powell's weirdly talented films such as *A Matter of Life and Death*; the comedy *Genevieve*, which established Kenneth More as a star, and a succession of fine war films such as director Herbert Wil-

cox's *Odette* starring his wife Anna Neagle, Michael Anderson's *The Dam Busters* and *The Cruel Sea*.

Some of these films did well internationally, but until the cultural landslide of the late fifties British films were not a big part of world cinema. Until then Britain's greatest contributions were human exports: filmland's most indestructible leading man Cary Grant (born Archibald Leach in 1904 in Bristol); the best-known most universal screen comic the world has even seen in Charles Chaplin; the greatest director of thriller films, Alfred Hitchcock. Chaplin's figure of the defenceless tramp preyed upon by dogs and cops, and always with an empty pocket, but still keeping his romantic dreams, grew out of his own wretchedly poor London childhood. It evoked an immediate response from poor audiences all over the world, especially America's new immigrant masses. *The Gold Rush* must still rank as one of the great comic pictures of all time, a silent picture which stands revival at any time, as television re-runs to grateful audiences prove. The greatest exponent of mime there has ever been, Chaplin in his later films, especially those that lapsed into sentimentality inevitably provoked critical reaction. But when you were born in 1889 and are still making films in the 1960s you are entitled to a little indulgence.

Alfred Hitchcock (born 1899) is one of those rarities whose work has got better and better as he has grown older and older. There cannot be many septuagenarians whose creative life has spanned half a century of whom that can be said. Perhaps that is because of the Hitchcock philosophy: 'The art of directing for the commercial market is to know just how far you can go. In many ways I am freer now to do what I want to do than I was a few years ago. I hope in time to have more freedom still—if audiences will let me.'[5] He said that as long ago as 1937. In 1939, though still as British as a bowler hat, Hitchcock went to live in America, where all but two of his subsequent films have been made. *Shadow of a Doubt* (1943), in which Uncle Charlie makes his living by

5. Charles Davy (ed), *Footnotes to the Film*. Lovat Dickson, London, 1937.

murdering wealthy widows in California, is Hitchcock's own favourite. *Rebecca* (1940), from Daphne du Maurier's novel, is outside the Hitchcock run of macabre comedy, though it certainly has plenty of chilling moments. Indeed much of Hitchcock's work in this period lacks his unique trademark, a mixture of comedy and horror. The horror without the comedy lacks verisimilitude; for in a curious way we have to be able to laugh slightly with Hitchcock at his horror effects, otherwise they prove unacceptable. Laughter is the safety-valve which allows us to suspend disbelief. Hitchcock as the smiler with the knife has no equals He also handles sex comedy with a wonderfully deft touch. The fifties and sixties have seen the mature Hitchcock in complete control of his work. *Strangers on a Train, Rear Window, To Catch a Thief, The Trouble with Harry, Vertigo* and *Psycho* are among the best thrillers ever made. *Psycho*'s murder scene in the shower with blood gurgling down the plug-hole is one of Hitchcock's strongest shock effects. French cinema cultists have professed to read deep intellectual and symbolic meaning into his work. Hitchcock insists he merely wishes to entertain. If there were more like him the close-down of cinemas would be a thing of the past.

Chapter 47

MUSIC AND BALLET

'I consider Benjamin to be a great composer. Along with Mahler, Prokofiev, Miaskovsky, Stravinsky, Bartók and Berg, Britten can be classified as a classic of the twentieth century.' *Dmitri Shostakovich*

The paradoxical thing about Benjamin Britten is that though his music and operas are unmistakably English in feeling and subject, more than any other British composer in this or the last century he is truly international in his appeal. Perhaps a man must first know and love his own country before he can become a citizen of the world. Today Britten is the world's outstanding mid-century composer. The lure of his native Suffolk and the flat, melancholy coastline of East Anglia have been an ever-present influence and inspiration in his life and work. He was born at Lowestoft in 1913, the son of a dentist, and his mother, who was secretary of the local choral society, gave him his first piano lessons. His musical talent was precocious, and by the age of twelve he was studying composition with the English composer and virtuoso viola player Frank Bridge, and by the age of thirteen he had written reams of music.

After schooldays at Gresham's in Norfolk (where W. H. Auden had also been a pupil a few years previously) and an open scholarship to the Royal College of Music, he went to Vienna to work under Alban Berg. Work followed in London as a composer of documentary film music, but his first big success was the performance at Salzburg in 1937 of his *Variations on a Theme of Frank Bridge*. Some months before the Second World War broke out he left for America with the idea of settling there as Auden had done. They were not entirely happy years. Though he had become a

conscientious objector, the thought of remaining in America while his own country was at war was disquieting enough to stop him composing. Then occurred one of those extraordinary chance events that can change a person's life.

Sitting in the sun in California, Britten happened to be reading an article on the poet George Crabbe by E. M. Forster. Crabbe was born in 1754 at Aldeburgh, some twenty-seven miles down coast from Lowestoft, and Forster wrote of the little town huddled round its flint-towered church and sprawling down to the North Sea with 'expanses of mud, saltish commons, the marshbirds crying. Crabbe heard that sound and saw that melancholy and they got into his verse.' The war was still on, but, lured as if by a sea-siren's call, Britten packed his bags to return to his beloved Suffolk and the mill which he had bought and restored at Aldeburgh by the edge of the saltish commons. On the boat home he and his friend Peter Pears read the Crabbe verse-tales in *The Borough*, a poem told in twenty-four letters. One of them, Letter xxii, is the story of fisherman Peter Grimes, a rascally fellow who 'fish'd by water and filch'd by land' and was reputed to kill his apprentices by ill-treatment. He is then hounded by the villagers and dies.

The story stuck and grew in Britten's mind; it became the opera which electrified the audience who heard its world première at Sadler's Wells on 7th June 1945. It was the first opera to be produced in any European capital since the war began; more than that it brought back opera to the life of the nation; for the British now had opera of their own to be proud of instead of always having to rely on foreign works. Though the appeal of *Peter Grimes* was to prove international the tone is all English the round of hornpipes, the tunes in the pubs, church bells on a Sunday morning from a village church. Peter Grimes (played by Peter Pears at the première and very many times since) is a moody, wayward man living alone on an upturned boat on the top of a cliff.

When Grimes's boy apprentice dies during a stormy fishing trip the villagers decide that Grimes is responsible for his death. The opera gives a harrowing picture of the anger

of the whole community. Grimes is at odds with his persecutors of the chorus, at odds with the sea which dominates the lives of all of them and he is also at odds with himself, needing love but too proud and stubborn ever to invite it. When he gets another apprentice the villagers storm the cliff-top hut to take the boy away. Grimes is hurrying down to reach the boat when the boy slips to his death. For a few days Grimes disappears and when he returns it is as a broken and lost man. One of his few friends in the village, a retired sea-captain, gives him the solution: to take his boat out to sea and sink it. And that is how Peter Grimes dies, while the villagers go about their ways unheeding and uncaring.

Billy Budd is another opera of the sea. It takes place on board HMS *Indomitable* in the year 1797, when flogging was common and mutiny was in the air. Billy Budd, press-ganged from a merchantman, is a lively boy, but when excited or angry he loses the power of speech and stammers. Provoked by Claggart, the sadistic master-at-arms, who falsely accuses him of mutiny, Billy becomes tongue-tied. In a frenzy of frustration he lashes out at Claggart in front of the captain. Claggart drops to the deck. Dead. Billy is then court-martialled and condemned to death and much against the instincts of the kindly captain, who broods that he might have saved him, Billy is strung up to the yardarm. Such is the conflict between duty and compassion. Few operas tug more fiercely at the emotions. 'I suppose that if people can hear the sea in my music it is because I've always known the sea and the Suffolk coast terribly well. The sea is a terrifying creature. If you talk to the fishermen here you will know that they have a love-hate relationship with it,' says Britten.[1] In its time the sea has taken a heavy toll of Aldeburgh's lifeboat crews and her coastline. Even at the time of the Aldeburgh Festival, which was founded by Britten and Peter Pears and takes place every June, the sea which pounds on the shingle beach is a fairly joyless affair, swum in only by the hardy.

Britten has written more than a dozen operas since *Peter*

1. The *Observer*, 7th June 1970.

Grimes. The Rape of Lucretia, centred on the assault of the beautiful Lucretia by Tarquinius, Prince of Rome, is a real pioneering work, original in concept. It is one of several chamber operas by Britten scored for twelve orchestral players and six or so vocal soloists. So is the comic opera *Albert Herring* and the operatic adaptation of Henry James's ghost story *The Turn of the Screw*. Albert Herring works in his mother's greengrocery shop, a timid paragon of virtue till someone slips rum in his lemonade at a May festival on the vicarage lawn. It is one of Britten's merits as a composer that he can be both sombre and gay. In particular he has had a lot of fun, and given a lot of fun to children. *Let's Make An Opera* is an opera about a group of children who set out to make an opera. In the opera within the opera a group of children in a country house rescue Sammy, the sweep's boy, who has got stuck in the chimney.

The boys and girls at Aldeburgh performed it for the first time at the Festival in 1949. The audience also participates and is divided into sections, each giving a different bird cry. *Noye's Fludde* includes such interesting instrumentation as mugs, sandpaper and a wind machine. In more serious vein Britten wrote his *Children's Crusade* for the fiftieth anniversary of the Save the Children Fund, and entrusted the first performance to the choir of Wandsworth Comprehensive School. Britten is versatile. *A Midsummer Night's Dream* is a setting by Peter Pears and himself of Shakespeare's play and some of the effects with harp and celesta are brilliant. Rather than compose on paper he 'hears' everything first with a sort of inner ear of great sensitivity; he therefore composes very fast. Opera is only a fraction of his output. There are his song-cycles and canticles, and over a dozen choral works, of which *War Requiem* has had great success. It uses the bitter anti-war poems of Wilfred Owen with parts of the Catholic liturgy, a work of musical invention and emotional intensity—the most important English choral work since Elgar's 'Gerontius'.

It has been said that whereas Britten is a master of vocal music his inspiration is lacking in purely instrumental work.

Certainly his output has been smaller, but what there is has been memorable. One of the big influences in his life has been the Russian cellist Rostropovich, whose playing inspired Britten to write a Cello Sonata and Cello Symphony completed in the year of his fiftieth birthday. Some of his best work has been written not to exploit his own skill (he is a fine pianist) but to serve the skill of others such as the late Kathleen Ferrier's contralto, and Julian Bream's guitar. None has inspired him more than the tenor of his friend Peter Pears. The two live in an old farmhouse by the edge of Aldeburgh golf-course, a fruitful artistic partnership.

Very much a central part of their lives is the annual Festival. Planning is almost a year-round business. Imogen Holst, daughter of Gustav Holst, composer of *The Planets* suite, is one of the artistic directors and a shoulder for Britten to lean on. They bring enormous enthusiasm and drive to the task, as witness the disaster to the Snape concert hall, a converted malthouse known as the Maltings. It was opened by the Queen in 1967, then burned to the ground at the start of the 1969 Festival. Incredibly a new and improved concert hall was ready for the Festival the following year. Besides being a composer and pianist Britten is also a gifted conductor, a talent which he uses sparingly and usually at Festival time. 'Concerts take up an awful lot of energy. The trouble is that when I'm conducting I'm always learning. Practically everything I conduct is a first performance for me.'[2] In an age when many thinking artists like the Stravvinskys and Schoenbergs can react to the world only with gloom, Britten has a more balanced response. And what could be more joyous than the most popular of all his works, the one that children cut their teeth on when they first hear his work, the wonderfully impish and swinging 'Young Person's Guide to the Orchestra'?

Nor need opera be an ultra-rarefied taste. The year 1971 saw the screening of *Owen Wingrave*, the first of Britten's operas to be specially commissioned for television. It is a not unusual Britten theme, an adaptation of a Henry James

2. The *Observer*, 7th June 1970.

ghost story which he has turned into a plea for pacifism: Owen Wingrave, last of a long military line, refuses to follow the family tradition of becoming a soldier—a decision that is to cost him his inheritance, his bride-to-be and, in the end, his life. The fluid techniques of television—close-ups, fade-outs and soft focus enable Britten to dispense with many of the old-fashioned conventions of opera: time, space and the explanatory recitative could to a large extent be transcended.

English music has undergone a tremendous revival in the twentieth century. Two names in particular played a prominent part—those of Elgar and Vaughan Williams. The sort of excitement which attended Britten's *War Requiem* or *Peter Grimes* also attended Elgar's two symphonies when they were played to an astonished Edwardian audience. Sir Edward Elgar (1857–1934) had already made his name with the haunting *Enigma Variations* (1899) and *The Dream of Gerontius* (1900) which have had an international following, as have the violin and cello concertos. For the first time since Purcell, audiences were able to say, 'Here at last is a real British composer.' He was an open-air enthusiast and systematic punter with a separate bank account for racing. Indeed due to a rather prickly sensitivity he was more at home in the paddock than with musical colleagues. He was a traditionalist in music and a patriot, and leaves his indelible mark on the last night of the Proms with the *Pomp and Circumstance* marches—not that the words attached to 'Land of Hope and Glory' greatly appealed to him.

Vaughan Williams (1872–1958) has always been called a typically English composer. Did he not collect Old English folk-songs, hundreds and hundreds of them from the plough-boy to the oldest crone in the village? He did. Did he not write church music in the great English choral tradition – Sir Hubert Parry of *Jerusalem* fame was one of his teachers? He did. Did he not (as an agnostic) supply some of the finest tunes in the Church of England's repertoire? He did.

The *Wasps* overture and the Tallis Fantasia seem as British as the little market town of Down Ampney in Gloucestershire where he was born. But Vaughan Williams never saw himself

as a typically British composer, and his reputation is ripe for reassessment. He was a professional who could and did turn his hand to all kinds of music: opera, ballet, concertos for tuba and harmonica, and nine great symphonies. His approach to music was completely international. In 1908, already an established composer, he went to study under Ravel, three years his junior, having decided that his music had grown 'too lumpy and stolid' and that 'a little French polish would do no harm'.

Two years later he wrote his first symphony—the choral *Sea Symphony*—using Whitman's poems. He wrote his ninth and last symphony almost half a century later at the age of eighty-five, and put saxophones in the score for the first time. He continued composing till the last day of his life. The Grand Old Man of British Music might have been expected to be a traditionalist, but he never was, any more than he was an exclusively nationalist composer. His symphonies display the greatest imaginable variety, from pastoral smoothness to the violent clashing music of the Fourth Symphony of 1935, which may have been a reflection of the gathering storm-clouds over Europe. Vaughan Williams followed his own style as a composer regardless of trends and fashions in music, but in a massive opus he embraced practically every different style. Like those essentially 'national' composers, Sibelius, Grieg and Smetana, he was also a true international composer.

Vaughan Williams kept an open mind musically, believing that a composer should live with his fellows rather than shut himself off He and his great friend Gustav Holst would play their compositions to each other when they were only half written. Holst like Vaughan Williams drew much inspiration from the English choral tradition of folk-songs and church music but turned also to the 'new' music of the Continent; he experimented with bold new harmonies, and the impact made by Stravinsky's innovations can be seen in the orchestral suite *The Planets*.

Sir William Walton (born 1902) was only twenty-one when he wrote the whimsical musical accompaniment to

Edith Sitwell's poems for *Façade*. His viola concerto (1929) is mellow and romantic. The oratorio *Belshazzar's Feast* (1931) is a landmark in choral music and three years later he wrote a dramatic first symphony.

Most of Walton's outstanding contributions were pre-war, but Sir Michael Tippett (born 1905) has produced some of his most interesting work in recent years, seeking always new and more venturesome forms of musical expression. Tippett is an exacting artist who composes with difficulty and is very hard on himself. Like Sir Arthur Bliss, who at the end of the First World War burned all the music he had composed before starting from scratch again, so in 1930, after conducting a concert of his own music, Tippett scrapped everything he had written, including a symphony and several choral pieces. He simply decided he was not technically mature. Like Britten he comes from Suffolk. His enthusiasm to be a composer developed after hearing a performance of Ravel's *Mother Goose* suite brilliantly conducted by a youthful Malcolm Sargent. His parents sent him to the Royal College of Music, where his persistent, indeed stubborn, questioning did not make him over popular with the masters. He is a man of almost boyish enthusiasms. Like many of his generation he had a heavy political commitment to the left in the thirties. It was rather late in life that he made his mark as a composer. Even his earlier, rather easier, work like the Concerto for Double String Orchestra, written just before the war, had difficulty at first in finding a publisher. Finally the German Wilhelm Strecker accepted it and his letter was one of the last to reach Britain from Germany before war broke out.

Like Britten, Tippett was a conscientious objector, with a horror of war and pity for suffering. This is the message of his war-time oratorio *A Child of Our Time*, which deals with racial persecution in Central Europe. Tippett had asked T. S. Eliot to write the libretto. Eliot asked Tippett for a sketch explaining what he had in mind. When Eliot read the sketch he told Tippett: 'You have practically done the job yourself.' And so he had. It made him an instant celebrity—

but within days of writing the last bar he also went to Wormwood Scrubs following a hearing before a tribunal for conscientious objectors. Tippett describes *A Child of Our Time* as 'Music from the dark world'. In much sunnier vein is his opera *The Midsummer Marriage* (1952, first performed 1955), which if it is not an entire success as an opera contains an orchestral piece – the Ritual Dances – of an urgent, indeed sexual, frenzy. Words and music took him seven years to write. He is a man of philosophic penetration, mystic as well as composer, and his complex cantata for solo and chorus, *The Vision of St Augustine*, was inspired by Augustine's life and works. 'He made up his mind to set aside his concubine and be a Christian.' Augustine is a man with a vision of eternity and Tippet seeks to express the timelessness of that vision in the concert hall by having the singers use ejaculations rather than words. Interestingly this technique had been anticipated by Bliss almost half a century previously.

Tippett has described his opera *King Priam* (1962) as 'taut, sparse and condensed in the way classical Greek tragedy is condensed. . . . It is concerned with the problem of moral choice. It is constructed to drive forward inevitably to the tragic end - Priam's death at the altar as Troy burns.' Tippett's opus, though not large in comparison with the prolific Britten, includes string quartets, two piano sonatas, two symphonies and the beautiful but unusual piano concerto (1953), an ambitious work of long, elaborate movements, in which the complicated polyrhythms of the orchestra do dissonant battle with the piano. (Even Britten, an accomplished pianist, has been moved to comment: 'I wish your piano parts weren't so difficult.') Tippett's earlier work, including the *Fantasia Concertante* on a theme by Corelli and his song cycles *Boyhood's End* and *Heart's Assurance*, are much more straightforward, but Tippett is not a composer who will ever stand still. In his sixties, it could be argued, he still shows more promise than achievement. Which, in this context, is very definitely a compliment.

Richard Rodney Bennett (born 1936) is only the second

contemporary British composer to have an opera staged at La Scala, Milan. It is true that it was roundly booed by that supposedly discriminating audience, but with commendable resilience the composer went on stage and faced the hostile Italians with a wave and a laugh. That same opera, *The Mines of Sulphur*, had a great reception in New York, where Bennett had a Beatle-style impact, as did his second symphony, especially commissioned by the New York Philharmonic for its 125th anniversary season in 1958.

In addition to operas and symphonies, Bennett draws an income from film scores (*Darling, Billy Liar, Only Two Can Play*) and commercial jingles. He is also a talented jazz pianist and an admirer of Gershwin and Cole Porter. His mother was a composer before she married and his father was a children's story writer who, for a bet, wrote two popular songs. They turned out to be *A Brown Bird Singing* and *Bird Song at Eventide*, which earned royalties worth a small fortune. Despite his somewhat flamboyant background there is not much doubt about Bennett's claim as the foremost young composer of serious music in Britain today.

He was born in Broadstairs—he knows Edward Heath and composed a carol for the Christmas concert which the Prime Minister usually conducts. But he now lives in London, a home in Islington where his desk carries a whimsical sign 'Help Stamp Out Opera'. In fact if anyone does precisely the reverse it will be Richard Rodney Bennett. His opera *Victory* (1970), based on Joseph Conrad's novel of a drop-out living alone on an island in the Java Sea, has a rich musical content, with some amusing imitations of Victorian musical comedy. Serious music can do with a composer who bridges the gap between 'highbrow' and 'pop'.

England has never wanted for great conductors in the twentieth century, and the fact that the Promenade Concerts, opened in 1895, are an international as well as a national institution owes much to the tireless genius of Sir Henry Wood (1869–1944). When he was not conducting or rehearsing he was singing, painting, chopping down trees or

making his own furniture. His father kept a toyshop in Oxford Street, his mother was a Welshwoman and her love of native Welsh songs gave Wood his lifelong interest in vocal music. But Wood in moulding the programmes for the Proms took care to introduce composers from all over the world, mixing classical with modern. He also helped to establish Elgar, Vaughan Williams and Walton. Henry Wood, known for ever to his musicians as 'Timbers', died in the fiftieth season of the Proms, and few have done more (along with the BBC which sponsored the Proms from 1927) to popularize good music.

Curiously it was a row with Wood which led to the founding of one of Britain's best-known orchestras, the London Symphony. At the turn of the century when musicians were employed on a largely casual basis every job was vital. A conflict of dates was a perpetual nightmare to musicians, with the result that a system of deputies arose; a deputy engaged by the regular musicians would go to rehearsals or even to an actual concert if the original musician had found a more lucrative assignment. Understandably Wood detested the system: how could an orchestra be at its best with under-rehearsed musicians? He made the players of his Queen's Hall Orchestra an offer – a flat rate of £100 a year provided the Queen's had first call on their services. The offer, though genuine enough, enraged the musicians who valued their independence.

Fifty of them staged a walk-out and founded the London Symphony Orchestra, with two guiding principles: that it should always be run by its members, who would have a voice in everything, and that it would always insist on the very highest standards. The LSO began in 1904 as it meant to continue, with a brilliant first concert under the great Hans Richter. Today, under its principal conductor André Previn, there has been no departure from either founding principle, and the LSO is the most-recorded orchestra in the world. A musician can play for the LSO only after the most careful process of selection – auditions, a study of background and reputation and a series of trial runs with the

orchestra. A new member buys shares in the orchestra, which gives him a voice in its affairs, but he cannot sell these to a non-member. The LSO also co-opts freelances, who often become full members. London, because of the high standard of its musicians, has become very much a Mecca for recording, radio, film and television companies.

Formidable and idiosyncratic characters have walked the London conducting scene. By nature the conductor, rigorously wielding his baton and sweating his way through a dozen or more tailcoats a year, is a fit man. How else to explain the longevity of conductors, many of whom retain their vigour well into their eighties? Sir Malcolm Sargent, perennially youthful till his abrupt death of cancer at the age of seventy-one, declared: 'I have an energetic job. I spend up to six hours a day waving my arms about and if everyone else did the same they would stay much healthier. I don't have to play golf to get exercise.' The rivalry between Sir Thomas Beecham who died at eighty-two and Sargent (popularly known to Prommers as 'Flash Harry') was legendary. On hearing that Sir Malcolm had been conducting in Tokyo, Beecham commented: 'Flash in Japan, eh?' Another time Sargent was conducting in Israel during a frontier dispute and had been fired on by Arabs. On hearing the news Sir Thomas remarked: 'I had not realized that the Arabs were so musical.' Despite these acid jests they remained close friends.

Sir John Barbirolli, born Giovanni Battista Barbirolli, was, despite his name, born within the sound of Bow Bells and so considered himself a Cockney. He was a lance-corporal during the First World War and changed his first name to John when he had to listen to the sergeant-major calling the roll call with great difficulty: 'Guy Vanni—who is this guy Vanni?' His name will forever be associated with Manchester's great Hallé Orchestra—of which he took control in 1934 when its fortunes were at a low ebb. He began his career as a professional cello player, which accounts in part for the mellow string tone he could coax from the orchestra. The Latin in Barbirolli produced a sensuous

sound from his orchestra; the Cockney in him would cheerfully recruit his brass players from Salvation Army and works' bands often with great success, for he was a good judge of an orchestral player.

Sir Thomas Beecham (1879-1961) whose grandfather made his fortune from Beecham's Pills ('worth a guinea a box') preferred Mozart and Berlioz to the business he was expected to join. He devoted his wealth and talents, both considerable, to building orchestras and launching opera of a high standard in Britain. Inevitably with one of so flamboyant a temperament his ventures were often a failure financially, but not artistically. He championed Frederick Delius, when this Yorkshire-born composer was little heard. In 1932 he founded the London Philharmonic Orchestra and because of the personal link between conductor and players the playing reached the highest standard. After the Second World War he founded another great orchestra, the Royal Philharmonic. As a conductor his genius was for improvisation and an essentially personal interpretation; he conducted by ear and instinct and seldom with a score. Whereas a Toscanini or a Klemperer might treat rehearsals as a meticulous preparation for the performance, not so Beecham. 'When I am rehearsing I say: "We'll play the whole thing through from beginning to end. You will probably make some mistakes." Then they play it twice and make no mistakes. I say: "That is absolute perfection. We shall meet on the night of the concert—then I'll decide what I'm going to do."'

For Beecham his baton was a magic wand with the hint of an unpredictable genie inside. Neville Cardus recalls: 'I have seen Beecham's baton fly from his grip high into the orchestra's Empyrean. I have seen it entangled in his coat tails.' His experiments with tempo could be eccentric. He once ruined the third act of *Siegfried* at Covent Garden by rushing through it at breakneck speed, giving the singers barely a pause for breath, and was duly roasted by the critics. Next morning he told Cardus: 'You critics are indeed inhumane. When the third act began I took note of the time.

It was twenty minutes to eleven. My orchestra had been in the pit since half past six. The pubs would close at eleven.'[3]

Beecham stories are legend, and some at least are true. Women he considered a handicap to an orchestra; for one thing they inhibited language at rehearsals. 'If the lady is well favoured, I do not like to play near her. If she is not, I am afraid I cannot.' In one of his orchestras there was a solitary woman, a harp player, and Beecham got rid of her. 'She was a danger to the whole season. If she is not a danger that orchestra is not fit to be called an orchestra! The man who is not thrilled to the bone by the spectacle of a woman playing the flute, blowing a clarinet or struggling with the intricacies of a trombone is no man.'

In contrast to the Beecham flamboyance Sir Adrian Boult conducted in restrained and business-like fashion from the score. He it was who laid the foundations of the BBC Symphony Orchestra, and when he retired he was succeeded by Sir Malcolm Sargent, a one-time church organist, who brought efficiency plus a sense of showmanship to the rostrum, which established an immediate bond with the young people who went to the Proms. Of the great quartet of Beecham, Boult, Sargent and Barbirolli, it was 'Tommy Beecham', as the players always called him, who exerted the most powerful influence. He made the British public opera-conscious for the first time in centuries and at heavy cost to his own pocket—a job which is now being done by Arts Council subsidy. Under his direction too the ballets of Diaghilev brought a breath of rare talent to Covent Garden between the wars. Beecham's were the foundations on which others such as Sir David Webster were to build after the war, with the result that Covent Garden was to become one of the world's greatest centres for opera and ballet.

When the new Royal Opera Company was formed in 1946, Webster, one-time general manager of a Liverpool department store, brought business expertise as well as enthusiasm for music to his job as General Administrator. It was a period of growing pains, starting with the restoration

3. The *Guardian*, 8th March 1971.

of the Royal Opera House, which had been used as a dance hall during the war. Webster and his colleagues far from playing safe adopted a boldly adventurous policy - not always with complete success. The plan to produce operas in English ran into difficulty because there were insufficient English singers of the right quality. Foreign artists used in their place frequently murdered the language, if not the score. It is a bizarre commentary on the state of English opera at that time when Sir Arthur Bliss's *The Olympians* was performed in 1949 this was the first English opera to have a first performance at Covent Garden for over a century. Thereafter came Britten's *Billy Budd* and Vaughan Williams's *The Pilgrim's Progress* in 1951 and Tippett's *The Midsummer Marriage*, all splendid demonstrations of the Royal Opera's artistic vitality.

Meanwhile an exciting and brilliant young director, Peter Brook, brought unusual and frequently controversial visual effects to the stage. Sometimes there were howls of disapproval, including some characteristic barbs from Beecham, but Webster stuck true to his policy of adventure combined with technical excellence. Sensibly too, instead of an exhausting repertory system with a different opera every night, which lowers standards, there were a limited few each month. By 1960 the Royal Opera House's reputation was such that George Solti was lured away from his job as operatic director in Frankfurt to become musical director at Covent Garden.

Solti recalls his impressions when he first walked into the pit at Covent Garden. 'The spirit of the house was excellent: everyone working there from the singers right through to those on the technical side loved their profession. It was all very infectious and I enjoyed myself.' [4] Even so, Solti at first decided to turn the job down; but when his old friend Bruno Walter spoke warmly of Covent Garden he joined, and completed the process of transformation. Native singers of the calibre of Sir Geraint Evans (baritone) came into their own. England which once had to import her star operatic performers now began to export them, so that they were

4. *The Times*, 12th June 1971.

as well known at La Scala, Milan, or the Vienna State Opera as they were on their home territory. Solti recalls that his plan to put on a complete British Wagner 'happened much more quickly than I thought possible. This is why Covent Garden is now dominating the world with its Wagner singers'. British opera now attained to the best standards of the British theatre.

Paralleling the rise of British opera, indeed preceding it, has been the rise of British ballet. Yet in 1934 when Peggy Hookman from Reigate in Surrey made her first professional stage appearance in the Sadler's Wells ballet as a snowflake in the *Nutcracker* it was unfashionable to have a British name. So Peggy renamed herself Margot Fonteyn. Some years earlier Patrick Healey-Kay, son of a Sussex county cricketer, had renamed himself Anton Dolin, and London-born Lilian Alice Marks became Alicia Markova. The Markova-Dolin partnership was to become world renowned under their foreign-sounding names. British ballet being in the earliest stages of development it was deemed necessary to hide behind a fictitious French or Russian façade.

The great Diaghilev, when he brought his Russian dancers to western Europe in the first decade of the century, had inspired the various national ballets. Dolin had joined him in 1921 and Markova in 1924 when she was only thirteen—the earliest of the 'baby ballerinas'. The founding mothers of the ballet in Britain were two other members of the Diaghilev company—Marie Rambert and Ninette de Valois, who in fact was born in Co. Wicklow, Ireland, as Idris Stannus. Diaghilev had said: 'After the Russians the English have by far the greatest aptitude; some day in the future they will form their own school.' And so it proved. Marie Rambert was the first to open her own school, in 1920, and later the first British ballet company. Essentially she was a teacher of dancers rather than a great dancer herself. Among her pupils was Frederick Ashton, not only a great choreographer but later to become director of the Royal Ballet. In 1931 Ninette de Valois created the Vic-Wells Ballet which performed at both the Old Vic and Sadler's

Wells. During the war the Sadler's Wells ballet, as it was renamed, toured the country and was immensely popular. At war's end it was invited to make its home at the Royal Opera House, and in 1956 it received a royal charter.

Today few would dispute the supremacy of the Royal Ballet or of its incredibly durable prima ballerina Dame Margot. She was only seventeen when she danced Giselle. That was in 1937 and her partner was Robert Helpmann; more than three decades later she was still dancing the same role with Rudolf Nureyev, a man nineteen years her junior. Yet even in her fifties in the robustly competitive world of international ballet she was miraculously able to keep her body supple. A ballerina needs as much strength, discipline and muscle control as a top athlete, and only that strength and control, plus practice, can give the audience the impression of effortless, almost frail, grace that is the hallmark of the great ballerina. Perfect control is also necessary before a ballerina can properly communicate emotion and expression. Fonteyn has these qualities and is also blessed with the ideal height and proportions for a ballet dancer.

With that typically English preference for understatement she denies being a highly dedicated artist. 'When I was young I tried in a very half-hearted manner to be dedicated, but I could very easily be diverted and persuaded to go to a party.' Indeed on the eve of the aforementioned performance of Giselle she recalls going to a big annual ball—'ballet or no ballet I wasn't going to miss that'—and braving the tut-tuts of her elders who felt she should be in bed resting. 'What, go home and miss all the fun?' she replied. She is not totally committed to dancing to the exclusion of every other interest—and that has saved her from the over-anxieties of less relaxed performers.

'I work hard, yes, very hard. I have a terrible sense of responsibility. If somebody asks me to do something I hate to do it badly.'[5] A large part of her life today is the care of her husband Dr Roberto ('Tito') Arias, former Panamanian Ambassador to Britain, who was shot and paralysed by gunmen in Panama in the summer of 1964. They had been

married then for nine years. 'A woman is never complete . . . she only knows her true identity when she finds it with her husband.' There followed long months of getting up before six in the morning to be with her husband at the Stoke Mandeville hospital, where he was convalescing. Then she would hurry on to work.

And how ranks Fonteyn purely as a dancer? She is disarmingly modest. 'Let's face it, everything's difficult in ballet. To do the steps well is difficult, and there are a lot of things which I don't consider I do at all well. Anybody who's knowledgeable about *Giselle* wouldn't consider I do it well either, because you could find many, many dancers who could do the ballet much better.' [5]

Yet Fonteyn and fellow superstar Rudi Nureyev were for more than a decade the most famous duo on the ballet circuit—as familiar to New York audiences as to those in London. There have been technically better dancers than Fonteyn—the Royal Ballet's Merle Park, nineteen years her junior, is rated the best Giselle in modern ballet. Other brilliant and vital dancers such as Antoinette Sibley have perhaps been overshadowed. Yet to Fonteyn still belonged the mystical feminine magic to touch the heart and bring tears to the eyes more easily than any other dancer.

As Fonteyn has been the Royal Ballet's most illustrious exponent of the dance so Sir Frederick William Mallandaine Ashton has been its great creator. It seems more appropriate to call him simply Sir Fred. He is small, modest, unassuming, with quick nervous movements, like a mousy character out of Beatrix Potter. It was a rather happy choice, when he made his first ballet film based on five Beatrix Potter stories, that he should appear briefly in the picture as Mrs Tiggy-winkle, the washerwoman-hedgehog complete with mob cap. For thirty-five years, the last seven as director, till his retirement in 1970, Sir Fred was choreographer extraordinary, perhaps the greatest in the world, to the Royal Ballet. He launched around eighty ballets and helped to model the career of Fonteyn.

5. The *Guardian*, 25th February 1970.

As his genius developed so did the Royal Ballet's. He was teacher and guide as well as creator and director. He created a British school of dancing with its own flavour—a blend of poetic feeling, restrained elegance and a penchant for the classical, and sheer English charm. Yet he was born in Ecuador, where his father was in business, and as a child of ten or so went to see the great Pavlova dance in Lima, Peru, where his father acted as consul. He immediately asked: 'Why is she so ugly?' But by the end of the evening he had set his heart on a career of ballet.

He might have been a dancer, but lacked the right physique. He might indeed have missed a career in ballet altogether, for when the family returned to Britain he was sent to work in a City firm of exporters. His knowledge of French and Spanish made him much in demand to handle foreign correspondence, but an unfortunate error putting a decimal point in the wrong place—cost his firm £1,000 and much to his delight his services were dispensed with. He was already taking dancing lessons and now longed to enrol full time. 'My father never knew I was learning to dance. He would have been horrified. My mother told him I was going on the stage. She thought it sounded better.' He went to Marie Rambert to continue his classes, but she needed a choreographer. A little later he might have made his career in New York, but was happily dissuaded on being advised that there was little future for classical ballet in America. With de Valois he watched the fortunes of the Royal Ballet grow till she handed over to him and he became the second director in 1963.

Now that he has left directing to his successor, Scots choreographer Kenneth MacMillan, Sir Frederick has more time to pursue his vocation as a great choreographer. Significantly and promisingly, some of his best work has been his most recent. It is a permanent mark he has left not just on British ballet, but on the ballet of the world. He once declared: 'I thought it of great importance that I should entertain, amuse and charm.' The ambition has been precisely fulfilled.

Chapter 48

THIS SPORTING LIFE

Sport is, practically speaking, a British invention. The codification of almost every major international ball game—baseball is a notable exception—is British. The headquarters of the most revered institutions of sport are in England or Scotland. If Britain had contributed nothing else to the world in the last century and a half she would still be entitled to limitless gratitude.

Wherever they have gone the British have taken their sport with them. Nikita Khrushchev, later ruler of all Russia, was introduced to Soccer when he worked in a British-owned mine at the coal township of Hughesovsky in the Ukraine. Badminton was invented on a rainy day at the Duke of Beaufort's seat in Gloucestershire, when an unknown guest decided to divert a house party by stretching a cord across the hall and using a couple of children's battledores to knock a shuttlecock back and forth. That was in 1871. The game was regularized by the British community in Karachi and the original hour-glass court (later superseded) was drawn up to take account of the shape of the gym hall in the Indian Army sports centre, where the game was first properly played.

One after another the great world-wide sports, football, rugby, golf, tennis, boxing, cricket, have been organized and the rules firmly imposed by the country which has always shied away from writing its own Constitution. The paradox may be explained by the conviction that the British can look after their political affairs in an informal manner but that sport is too important to be left to the vagaries of circumstance.

Much fun has been made of the British obsession with sport. There is Sir Francis Drake playing bowls on Plymouth Hoe while the Armada approaches, remarking that there is

time to finish the game and beat the Spaniards yet. There is Mary Queen of Scots being upbraided by Kirk elders for playing golf shortly after the murder of her husband, Lord Darnley. There is the Duke of York, later James II, organizing the first golf international between Scotland and England at the links near St Andrews. There is Henry Newbolt's rallying cry to the officers of the troops caught out in an awkward situation while guarding an outpost of the Victorian Empire: 'Play up, play up and play the game,' echoed eighty years on by Field-Marshal Montgomery's pledge to 'hit the Germans for six right out of Africa'.

The mock solemnity surrounding sport in Britain is best illustrated by the immortal item in the *Sporting Times* commemorating Australia's first victory over England: 'In Affectionate Remembrance of English Cricket, which died at the Oval on 29th August 1882 deeply lamented by a large circle of sorrowing friends and acquaintances. RIP. N.B. The body will be cremated and the Ashes taken back to Australia.' From this newspaper comment arose the Ashes in urn form, for which Australia and England regularly contend.

Serious-minded folk in the twentieth century no less than in the sixteenth and seventeenth centuries worried over the British devotion to sport, so sadly at variance with the German dedication to martial pursuits. Kipling wrote of 'muddied oafs and flannelled fools', and in 1912 an exasperated couplet was addressed to golf fanatics:

I was playing golf the day that the Germans landed,
And the thought of England's shame nearly put me off my game.

In the war that came British soldiers went over the top during that extraordinary and spontaneous truce of Christmas 1914 to kick a football with their German opponents. Devotion to the same game was evidenced in the General Strike of 1926 when strikers and police, instead of fighting, played soccer with one another. In 1940 Dunkirk was presented as a sort of sporting encounter with the little ships,

regatta-style, snatching victory from the jaws of defeat. Figures of German planes shot down in the Battle of Britain were published like cricket scores: '100 not out' read one headline.

Cricket is the most peculiarly English of the major sports. It is played on a very small scale in Scotland and Canada and is confined to the lands of the Commonwealth plus South Africa. A whole history, a whole philosophy, has grown up around this game. It has its bible, Wisden, its legendary figures—Dr W. G. Grace, Hobbs and Sutcliffe, Don Bradman and scores of others. King George V damned cricket as the game that nearly broke up his empire. This was in reference to the famous body-line controversy which darkened the English tour of Australia in the early thirties. Under the captaincy of the ruthless Jardine—who was a Scot the English bowler Larwood sent deliveries hurtling down at the body of the unfortunate batsman. The Australians, who could be just as bloody-minded, but had no one to match Larwood's speed, cried 'foul', and the issue went to the British Cabinet which had its fair share of cricket enthusiasts, notably Stanley Baldwin. The matter was dealt with at official cricket level following promptings by the politicians.

Cricket is one of the intangibles which hold the countries formerly constituting the British Empire together. In the closing phase of the British Raj in India, agitators were known to break off haranguing the crowds to discover the latest Test score from the wireless vans of the 'brutal British soldiers'.

Today the game is played widely and to a high standard in the West Indies, England, Rhodesia, South Africa, India, Pakistan, Australia and New Zealand. Canada and the United States have a few cricket clubs and the game is growing in popularity there, but they are nowhere near first-class standard. The top nations between whom are played major Tests are England, Australia, South Africa and the West Indies. In what might be termed the minor league, though always liable to jump into the major, are India, Pakistan,

New Zealand. Once its relations with the others are regularized, Rhodesia will come into this category.

The game reflects the English character to no little extent. It gives the appearance of gentleness. It is slow, sometimes to the point of appearing to atrophy altogether. Lord Mancroft once quipped: 'The English not being a religious people invented cricket to give themselves some conception of eternity.' Cricket is elegant and bound by rules of etiquette that are strictly obeyed; not least the unchangeable break for tea. It has terms which only the English could think up. 'Silly mid-on', 'silly mid-off', 'square leg', 'bumpers', 'googlies', 'Chinamen'. It has elaborate ritual from 'inspecting the wicket' to 'appealing against the light'.

But cricket is not the gentle game it appears to be. The ball is hard, and if it strikes the head or an unprotected part of the body is very painful indeed. Moreover the tactics are not nearly as gentlemanly as they seem. Every artifice of gamesmanship is employed such as frightening the batsman with fearsome bowling and a close field, or shattering his confidence with resounding appeals to the umpire for a catch or l.b.w. decision. But once the game is over, win or lose, the practice of shaking hands is altogether English too.

It would be nonsense to suggest that the English don't mind defeat. They mind it very much. But they have been taught by schoolmasters or parents or their fellows not to show disappointment. The stiff upper lip is a Victorian public-school sentiment and far from universal, but it has been applied, fairly uniformly, in sport probably because team games sprang from the public school and became infused with public-school ideals.

The capacity to lose gracefully has been transmitted from the British Isles to other parts of the world and is one of the major contributions England has made to global goodwill. While cricket has certainly had its share of political ill-feelings—rioting in the West Indies and Pakistan during England's visits there; the cancellation of the 1970 South African Cricket tour of England as the result of threatened anti-apartheid demonstrations; and the critical dispute be-

tween England and Australia concerning body-line bowling —the sport has cemented relations between countries with little else in common.

The MCC—the *Marylebone* Cricket Club, a title which, like so much else in English life, is a delightful fiction—rules the cricketing world. Its traditions flourish in an age where change is constant, and this very stability is a virtue which should not be underestimated. Politicians come and go. Some leave a trail, others merely a smear, but the cricketing achievements of men like Gary Sobers, Graham Pollock, John Edrich are real and enduring. They are talked about by youngsters in Kingston, in Durban, Sydney, Wellington, Delhi, Leeds. As the premier cricketing nation, and certainly one of the two best in the world (South Africa is probably No. 1), England has every justification to be proud of her accomplishment here.

Accompanying cricket as the popular summer-only sport is lawn tennis. Like cricket—and indeed almost all games—its origin is lost. Some form of tennis was played in the Middle Ages. One of the early Stuart Kings of Scotland was murdered after a tennis match not, of course, because of his performance. But the game in its modern shape owes everything to the sportsmen and women of England.

Wimbledon is to tennis what St Andrews is to golf, Lord's to cricket and Epsom to racing. The All-England Lawn Tennis and Croquet Association governs the rules of the game and has done so since 1877. The rules themselves, including the height of the net, have been changed from time to time, but the origins of the modern game are clearly traceable to the application of Major W. C. Wingfield for letters patent for the invention of 'a new and improved court for playing the ancient game of tennis'. The terms of the patent which he set down were adopted in essence by the All-England Club when it drew up the first rules. In the eyes of contemporary observers the pastime provided 'a new and agreeable experience for women to compete on terms that are tolerably equal'.

Vicarage tea-parties were the normal surroundings for

tennis and croquet (another English pursuit which appears genteel, nay demure, but which packs more gamesmanship into it than many a robuster sport) until volleying altered the whole approach and turned a gentle tip-tap into a thrilling encounter.

From the 1880s the Wimbledon Open Championship grew in stature until it became the world's foremost tennis tournament. With its rather autocratic set-up the British tennis rulers are not subject to the pressures faced by other global sporting legislators, who are more and more influenced by political decisions. Competitors at Wimbledon play to Wimbledon's rules—or they do not play at all. And as professionals are now admitted, indeed welcomed, at the hallowed ground Wimbledon's status has been further enhanced, in marked contrast to the international Davis Cup, which still shelters the myth of 'amateurism' and, by excluding professionals, is simply a competition for the also-rans.

Since the Second World War Australia has come to dominate Wimbledon in common with all other tennis tournaments. Mrs Anne Jones, Wimbledon Champion in the sixties, has held aloft the British flag on the women's side, but Britain is trailing Australia and the United States in tennis performance. This, however, does not detract from the fact that British tennis legislation and British standards are the ones by which all others are judged. Although England's climate cannot compare in sunshine hours with California, South Africa or Australia—and tennis depends more than most sports on dry weather—Britain is still among the top half dozen nations, and the game is widely played at very low rates in club and municipal courts throughout the land.

Comparable with tennis in being a non-team game, but unlike it in every other way, is that world-wide phenomenon: golf. Just as the broad-bosomed Church of England projects the national character of England, so golf mirrors the personality of Scotland which gave it birth, nourished it, loved it, exported it and boasts its capital, St Andrews.

Golf has been called 'a good walk spoiled' by its detractors, and rouses the fiercest partisanship among its de-

votees. There are hundreds of stories illustrating, or mocking, this dedication. Let two suffice. One tells of the golfer who badly sliced his ball from the tee to the road. The ball hit a cyclist, who careered into a car, which crashed into a coach. There were many casualties. The golfer turned in despair to his opponent: 'My God, my God, what should I do?' 'Well,' said his opponent, 'if I were you I'd bring my right hand a bit more over the left.'

The other recounts a tight match between a pair who had never missed a Wednesday encounter for forty years. At the moment when one is lining up for a vital putt, a funeral cortège passes. Reverently the player lays down his putter, takes off his cap and stands with bowed head. When the cortège has passed he replaces his cap, picks up his putter and rattles the ball into the hole. 'Man,' says his opponent, 'that was a fine thing to do. To break your concentration to pay your respects to the funeral. I admire ye.' 'Ah well,' responds the reverential one, 'Ah'd been married to her for thirty-five years.'

The lure and the lore of the game are beyond measurement. It has been written about, rhapsodized over, satirized as no other sport. It has taken hold of countries as far apart as the United States and Japan. Golfers of outstanding repute hail from South Africa, Canada, Australia, New Zealand and the Argentine, areas where British influence has been strong; and the sport is swiftly spreading on the European continent. It will be fascinating to see if this most capitalistic-style games takes root behind the Iron and Bamboo Curtains. There is no doubt from where its roots spring. In every department golf speaks of the Scots approach, not merely to sport but to life.

The game was so well established in the Northern Kingdom by 1547, whatever its form, that it had to be 'utterly cryed down and not to be used' lest it interfere with the defence of the realm. However, King James IV was a golf enthusiast and the sport flourished under royal patronage. James IV was killed at Flodden by the armies of England. But revenge was at hand. The English got bitten by the golf

bug too. Robert Browning quotes Catherine of Aragon, wife of Henry VIII, writing to Cardinal Wolsey: 'And all his subjects be very glad, Master Almoner, I thank God, to be busy with golf, for they take it for pastime.' Henry's succeeding wives would doubtless have been thoroughly content if he had stuck to golf. Being golf widows was surely preferable to the fate that befell them.

With the Union of the Crowns golf in England was established on a regular basis and it is reported that a course was laid out or at least used at Blackheath. The ancient Leith Links near Edinburgh had only five holes of 400 yards and upwards. St Andrews once had twenty-two holes, but when the Royal and Ancient emerged as the premier club the round was standardized at eighteen.

The first Open championship was played at Prestwick in 1860. For thirty years it was won by Scottish professionals, young Tom Morris winning the first trophy outright with a total of 149 for 36 holes. Considering that the game was then played with ancient wooden clubs and stone balls and that greens and fairways were uncut, that is a remarkable achievement.

Within half a century golf was on its way to becoming a world-wide obsession, yet the whole philosophy of the game remains Scottish. It is democratic (despite some absurd attempts to distinguish between 'artisan golf' and other, presumably 'aristocratic', golf). The handicapping system ensures that the veriest rabbit has a chance against the fiercest tiger. The individual plays himself. He has to conquer his own failings; blot out of his mind the fluffed putt, the shanked iron or duffed drive at the previous hole; concentrate everything on hitting that little white ball where he wants it to go. Then there is fate. At times the ball seems to be guided by heavenly force which confirms the good Scots Presbyterian's belief in predestination. At other times the ball breaks the wrong way, tumbles into bunkers or burns, hangs trembling on the lip of the hole—and the Scot is convinced of that other Calvinist doctrine: original sin. Golf is humbling. It reminds one of the littleness of human effort. It

is also, like death, the great equalizer, for the man of business or professional success would give his eye-teeth to be able to play like the fellow who has scarce two pennies to rub together.

The Scots professionals took the game all over the world, but in an era of deference the amateur too played a significant role: John Ball, Harold Hilton, Horace Hutchinson for England, Freddie Tait, J. I. Laidlaw, Leslie Melville and Robert Maxwell for Scotland. They did for golf what W. G. Grace, 'Ranji', F. S. Jackson and C. B. Fry did for amateur cricket.

In the twenties America took to golf with passionate intensity. Since then, British domination ceased in Walker Cup (amateur) matches between the two nations; the British Isles did, however, triumph in 1971. The terrifying American 'circuit' (the series of matches for various trophies played in the United States for huge prize money) has drained professional skills from five continents. No one can be considered a top golfer unless he plays regularly in America. In some respects the game as a professional way of living has been reduced to a big money formula with emphasis on the thousands of dollars that can depend on a single putt. Still, perhaps this is a logical extension of another Scottish characteristic.

Between 1951 and 1969 Britain did not win her own Open Championship once. Max Faulkner took the trophy at Portrush in 1951, but he did so against a field which lacked the real American challenge. The United States pros, led by Sam Snead, concentrated on the big three American prizes: the US Open, the Masters and US Professional Golfers' Association, plus a host of commercially sponsored tourneys all rich in dollar yields.

The Commonwealth, notably Australia and South Africa, provided the principal rivalry in the early fifties, which also saw the disappearance from first-class international golf of Britain's outstanding competitor, Henry Cotton, a man well able to meet and defeat the best of the United States. The downgrading of the British Open ended with the arrival in

1953 of Ben Hogan, next to Bobby Jones probably the greatest golfer of all. He arrived in the United Kingdom in response to an appeal by another outstanding United States competitor, Walter Hagen, who records: 'In spite of all the new fields to conquer offered our present-day golfers, I still hold that no golfer is a true champion until he has played and won the great British Open ... until he conquers those windswept seaside links. Before Ben Hogan won the National [US] Open in 1953 I got on the telephone to urge him to try for the British Open. He did and by winning added tremendously to his stature as a top golfer of all time.'

The Open – the British, as Gary Player observed, don't call it the 'British Open' – is now unquestionably the premier tournament and has joined the three major United States competitions to complete the 'Grand Slam' of golf achieved only by Gene Sarazen, Ben Hogan, Jack Nicklaus and Gary Player.

For British golf addicts – and indeed for all British sportsmen – the golfing day of days came when the young Scunthorpe-born professional Tony Jackling brought the Open back to Britain in 1969. In the same year the Ryder Cup – the professional tourney between Britain and the United States – was halved. And so the long, long night of British professional golf was over.

The dawn came up like thunder when Jacklin won the United States Open of 1970 with an astonishing four rounds in none of which did he go over par. He thus became the first Briton to win the American Open for half a century.

Golf remains a democratic game in Britain, especially in Scotland. The annual cost of playing superb courses in Scotland – the envy of other golfing countries – is about one per cent of the cost of subscription to a similarly qualified course in North America. Golf is an expression of the British genius. Let the last word on the subject be with a golfer of global renown, Gary Player, commenting on the Muirfield course where he first won the Open, though he says Carnoustie is more difficult, indeed the toughest in the world.

There it was, laid out along the shore of the Firth of Forth, 6,800 yards long through and across the sandhills, a hard wind running from west to east, big sandstone clubhouse, the grimly named Grey Walls Hotel, just behind stone dykes, everything vigorous, virile, hard, lean, masculine, muscular. Very Scottish. Not a place for liberties or niceties or sophistication. A place that insisted you prove yourself before it would relent and come half way to meet you. Dour, very dour.[1]

If golf is as Scottish as haggis, Rugby football is wholly and completely English. It takes its name from Rugby School, where in 1823 William Webb Ellis made athletic history by running with the ball in his hand. Until then it was permissible to catch the ball, but it had then to be laid on the ground to be kicked. This was football; a game lost in the mists of antiquity and played to as many rules as there were places to play. What William Webb Ellis did was to *run with the ball*. His feat was considered 'jolly bad form' at the time, but is now commemorated on a plaque erected on the Close at Rugby, which states:

This stone commemorates the exploit of
William Webb Ellis
who with a fine disregard for the rules of
football
as played in his time
first took the ball and ran
with it
thus originating the distinctive feature of
The Rugby Game
AD 1823

Now the action of Ellis is recorded simply because former pupils of Rugby took the trouble to delve into the school's history to get a first-hand account of how the game known as Rugby football developed. This they did in 1895, by which time the basic rules of the game had evolved and are, in all

1. Gary Player, *Grand Slam Golf*. Corgi Books, 1967.

but minor particulars, the same today. But William Webb Ellis did not launch this on his own, he merely started a trend. What gave all types of team and athletic pursuits—cricket, soccer, hockey, cross-country running—great impetus was the arrival of Dr Thomas Arnold as headmaster of Rugby five years after W. W. Ellis had left the scene.

The good doctor was no games fanatic. He rarely bothered to watch matches. What he did was to use sport as a means of tempting the boys of Rugby School from drinking, gambling, poaching and such disreputable pursuits, so realistically described in *Tom Brown's Schooldays*, as roasting new boys over a fire. Under Arnold sport used up energies that would otherwise have been employed on undesirable occupations. Hard running and cold showers were the answer to immortality. Muscular Christianity was the way to put evil thoughts out of young heads, 'a healthy mind in a healthy body'.

And so it came to pass that sport became the dominant theme in public schools. Arnold *was* Rugby. Rugby had evolved a particular type of football which was more or less codified in 1846, and Arnold's disciples, his youthful masters, took the gospel of sport to other schools. With the mid Victorian education explosion, a host of new public schools, designed to train men for the administration of a mighty empire, came into existence. Uppingham, Sherborne (old grammar schools transformed, Cheltenham, Marlborough, Rossall, Wellington, Clifton, Haileybury, followed the Arnold lead. With one accord they adopted the Rugby code. There were still local variations because inter-school matches proved so bloody and roused so much hooliganism among the spectators that uniformity of rules was prevented.

In Scotland Arnold and Rugby won followers too—Edinburgh Academy, Loretto, Merchiston, Fettes joined the Rugby bandwaggon. Eton and Harrow, far older than Rugby, remained aloof with their own peculiar games. But Charterhouse and Winchester stuck to 'genuine' football. Thus the split developed. What united the devotees of Rugby and football was the supremacy the followers accorded sport over academic achievement. An old Carthusian recalled that

the meanest member of the first eleven had more prestige than the most brilliant scholar. Here is the description by Hughes of a boy's attitude to sport: 'This is worth living for; the whole sum of schoolboy existence gathered up into one straining, struggling half-hour, a half-hour worth a year of common life.' This attitude to sport has been blamed as the cause of many of Britain's woes—but at least the British still know how to enjoy their leisure hours.

Rugby was wholly a product of the public school system and has remained in England and Scotland—though not in Wales and Ireland a middle-class pursuit rather than the darling of the masses, which is Association football.

Why this should be so is not wholly clear. Admittedly Rugby needs more players, fifteen against eleven for Soccer, and so is more difficult to organize. Also football can be played in the street with a tennis ball or even wrapped-up newspaper with little danger to clothes or shoes: whereas Rugby can only be played on a proper pitch with proper clothes, boots and goal-posts.

Rugby itself split into two camps over the class business. Public schoolboys or men of public school background deplored the payment of players, but in the north of England, where there were far fewer public schools, the idea began to grow that there was nothing wrong in paying to get the best men for your team. According to an article in *The Contemporary Review* by R. K. Ensor in 1898, entitled 'This Football Madness', Rugby club managers in the north were embarking on 'petty trickery, mean cheating and espionage to win the ablest players to their sides. These tactics included dropping money into men's boots, slipping it into lavatories, delivering tons of coal to the fortunate footballer's house'. Finally, twenty-seven Northern clubs decided to legalize the whole business and pay players openly, and so Rugby League was born. It continues its distinctive life, with thirteen players instead of fifteen and no set scrums. The league flourishes in Lancashire, Yorkshire, Cumberland, Westmorland and has a certain hold in Wales and France,

plus Australia. It does not, however, contend with Rugby Union as the main 'handling game' of football.

The Rugby Union comprises all those countries which play the game and agree to abide by the rules as laid down in the form that has emerged since William Webb Ellis The principal members are England, Scotland, Ireland, Wales, France, South Africa, Australia and New Zealand. Of these countries the superb All-Blacks of New Zealand are the most formidable, despite the smallness of New Zealand's population. The Springboks of South Africa also have a reputation for hard, skilful Rugby. When they tour overseas the English, Scots, Welsh and Irish unions join together to form the British Lions and must be regarded as a major force, as their memorable victory in the 1971 Test series against New Zealand proved. In the home internationals France takes part along with the four national sides of the British Isles, with the Welsh having the best record.

Thus, France apart, Rugby like cricket is basically a game of the British Commonwealth: a projection of the British way of life. It has been argued that William Webb Ellis did not invent Rugby at all; that the story of his exploit was the fruit of a Rugby antiquarian, who wrote the legend into the school magazine four years after Ellis's death, and that the committee of inquiry in 1895 suppressed counter evidence that would have exposed the Ellis feat as a myth. But the British in 1971, the centenary year of the Rugby Football Union, were unlikely to displace W. W. Ellis in their affections. True or false the image of the eccentric act that changed the course of events is dear to British hearts. What is beyond dispute is that Rugby is British in origin and character. It represents the physically courageous side of the British personality, marching with the 'stiff upper lip' creed.

Rugby footballers do not lie on the ground writhing as though in mortal agony when they are kicked or pummelled. They get up and get on with the game. Nor do they show excessive emotion when one of their number scores a try. Nor do they dispute decisions with the referee by mute appeals to heaven as if asking for divine intervention to right

injustice. Such deplorable scenes are regularly witnessed on the professional Soccer field and consequently Rugby men glow with self-satisfaction. Yet football, i.e. Association football, is also thoroughly British and exhibits the extrovert nature of the British as Rugby does the stern, unyielding part and cricket the velvet-with-the-touch-of-iron. It is to Association football, hereinafter referred to as 'football', that Britain owes a global reputation as 'father of sport'.

The World Cup was first won by England in 1966, but the true measure of her contribution to football was marked three years earlier when England defeated a Rest of the World side 2–1 to commemorate the centenary of the Football Association. It was a fitting tribute. For this is truly the world game. If ever war is abolished football provides the ready-made substitute for letting off steam and for demonstrating national partisanship.

Football is not just a substitute for war; it has actually been a cause of one between Honduras and El Salvador. The two countries clashed at arms during preliminary contests for the World Cup of 1970. More than 3,000 casualties were suffered before peace was restored. Riot barriers and moats exist at most Latin American grounds. Governments have quailed before the rage of supporters downcast at their country's 'undeserved' defeat. Britain herself, the bastion of balance and toleration, has not been immune from football fanaticism. In 1969, 10,000 enraged Glasgow Rangers supporters invaded Newcastle United's ground to exact a destructive revenge for their team's defeat. Nor is this a recent phenomenon. As far back as 1909 Rangers and Celtic fans invaded the pitch at the close of a Cup Final in protest against the referee's decision not to play extra time; they burned the goal-posts.

For generations the supporters of these two teams, Rangers the champions of the 'Protestant cause', Celtic of the Roman Catholics, have waged a kind of war. So severe has it been at periods that when the two teams play one another the followers are separated, by convention at the stadium and by police orders en route to the match. It is said

that the football enthusiast who fails to support Rangers or Celtic when they clash must be an athiest! For long this violent partisanship was regarded as being peculiar to the dour and passionate Scots or possibly to the northern English as well. But the process of being 'fitba daft', in the Glasgow vernacular, has passed through the whole of the British Isles and infects the whole of the civilized world. How astonishing that it all stemmed from the decision of the more demure public schools to play a game of football les ruffianly than Rugby. When the lads got to university at Oxford or Cambridge they needed a game with common rules, so started an association, hence Association Football.

Stoke City, the club which was later to win immortality as the side which Stanley Matthews adorned in his early playing days, started off -in 1863—as an Old Boys' Club for Carthusians (ex-pupils of the ancient and expensive Charterhouse School), who had been apprenticed to the North Staffordshire Railway Works. The first F.A. Cup Final in 1872 was between Wanderers, a team of old public schoolboys, and an Army team, the Royal Engineers. Gate receipts were £100, compared with today's figure for a Wembley final of almost £200,000. Blackburn Rovers was founded by former pupils of the local grammar school. From the formation of the Football Association in 1863, however (almost all the great popular games of the present era date their origin as identifiable and codified sports from this fruitful decade in Britain), teams sprang up which had nothing to do with grammar or public schools. Middlesbrough was inaugurated at a tripe supper. Rotherham United began when a few enthusiasts met under a street lamp. Manchester City, winners of the European Cup Winners Cup in 1970, was initially confined to employees of the Lancashire and Yorkshire Railway. The Arsenal was composed of men working at Woolwich Arsenal. Coventry City was set up for employees of Singer's cycle manufacturers. West Ham United —the winners of the European Cup Winners Cup in 1965 - were associated with the Thames Iron Works. One of the most formidable clubs of those days was Queen's Park,

Glasgow, amateurs then as today. This same team still owns the biggest stadium in Britain, Hampden Park, which has held close to 150,000 spectators.

Within a generation or so the Football Association had grown from ten clubs to ten thousand. Scotland of course had in the meantime established her own F.A. So had Northern Ireland. In 1885 professionalism was legalized and in 1888 the Football League was founded. A public inured to violent demonstrations may take comfort from this contemporary account of crowd behaviour after a match in quiet, semi-rural Shrewsbury: 'There were many thousand present at Shrewsbury on Easter Monday [1899], and the concomitants of betting, drinking, bad language were fearful to contemplate, while the shouting and horseplay on the highway were a terror to peaceful residents passing homewards.'

Northern football supporters were described by the *Pall Mall Gazette* as 'a northern horde of uncouth garb and strange oaths'. And, still in the nineteenth century, a distinguished author, R. K. Ensor, was writing of 'this football madness', illustrated by such episodes as the referee who was hooted and cursed every time he gave a decision and after the match had to seek protection in the pavilion from the violence of the spectators. That was in Shropshire, a county not noted for its Soccer fanaticism.

Though professionalism was legalized in 1885, it was regarded with distaste in the south, and when Arsenal adopted a payment system other southern clubs refused fixtures with them. Not that much money was involved. Luton Town for example, paid 1*s.* 6*d.* a week to each player on its books in 1891, with sixpence extra for away matches. Professionalism grew rapidly; so did transfer fees and 'under-the-counter' gifts to lure intended players from one club to another. In *Nineteenth Century* magazine a censorious Mr Edwards wrote an article 'The New Football Mania' deploring the idolization and awards of professional footballers. 'They are,' he said, 'objects of popular adoration and receive ovations in the street enough to turn the head of a Prime

Minister. They travel in saloon carriages and are seen off and met by crowds of supporters: their photographs appear in the shops individually and in groups and the newspapers publish woodcuts of them with biographical sketches. Lavish gifts are bestowed upon them; as in the case of West Bromwich Albion who were recently entertained to a banquet by their MP at which £5 was handed to all players with the promise of another £10 to come.' That was in 1892. So things have not changed so much after all. Except that for £5 read £500 or £5,000—the sum each member of England's 1970 World Cup team collected.

For many years, until the end of the Second World War, British football was supreme. The British were the masters, and while occasionally a British touring side might be defeated this was regarded as an unfortunate exception, like snow in June, rather than as a portent of things to come. In 1945 a new era dawned, however. A Russian football team, Moscow Dynamo, allegedly amateur, in fact full-time sportsmen, landed in the United Kingdom. They annihilated Cardiff City. They defeated the mighty Arsenal. They or rather their political masters behaved so badly that they achieved the impossible: they united the supporters of Rangers and Celtic. Rangers played Dynamo in a memorable match at Ibrox Stadium, for which it was estimated half a million had tried to get tickets. British servicemen around the globe, listening to the match on the radio, silently prayed that Rangers would get the equalizer from a penalty. Some went so far as to fall on their knees in supplication. They were rewarded. The game ended in a 2–2 draw.

None the less British football prestige had been shaken. It was partly restored when an all-British side beat the Rest of the World 6–1 in 1947 and it was regarded as a bit freakish when the United States defeated England 1–0 in England's first foray into the World Cup in 1950. What really smashed Britain's football image was Hungary's fantastic play at Wembley in 1953. The 'magnificent Magyars' trounced England 6–3. Later they beat them 7–1 in Buda-

pest. They put the Scots down 4–2 at Hampden. The British were no longer masters.

Slowly the recovery made progress. In the later fifties Scottish and English clubs entered the European competitions: Hibernians of Edinburgh was the first to do so, in 1955. In 1961 Glasgow Rangers became the first British side to reach a major European final.[2] Three years later Tottenham Hotspur of London, perhaps the most attractive footballing combination Britain has produced, won the European Cup Winners Cup. Two years later another London team, West Ham United, repeated the success.

In 1966 came the biggest triumph. England won the World Cup at Wembley. The next year Glasgow Celtic became the first British side to win the premier tournament, the European Cup, in Lisbon. The following year Manchester United repeated this achievement. In 1970 three British clubs - Glasgow Celtic, Manchester City and Arsenal reached the finals of the three European tourneys: the European Cup (for league champions), the Cup Winners Cup (for national trophy holders) and, less important, the Fairs Cup, now known as the EUFA Cup. Manchester City and Arsenal returned with the honours. Celtic narrowly failed to bring off a remarkable treble.

Even England's defeat in the World Cup in Mexico in 1970 could not dim the returned glory, and if the ten top British sides played abroad as they frequently did, it was odds-on that they would win most of their encounters.

Beside football, cricket and Rugby as team games, and tennis and golf as individual contests, the rest of sport occupies a much smaller part of mankind's leisure pursuits. Yet even in what might be termed the 'minor sports'—minor only in the scope of their appeal—the British influence is decisive.

Boxing both as an art and a spectator sport owes its existence to the Marquis of Queensberry who laid down its rules. Hockey was developed and codified by Britain, although the

2. And won it—the European Cup Winners' Cup—in 1971/2.

game is more popular, and more skilfully played, in India. Polo stems from hockey. Subalterns of the 10th Hussars at Aldershot read accounts of a version of the sport played in Manipur. 'Let's try it out here,' they agreed. And so armed with long-handled hockey sticks, often two tied together, they mounted ponies and engaged in polo with a billiard ball. In such a fashion did this noble pursuit come to the West.

India's influence contributed towards another well-known game. At the club in the hill station of Ootacamund—'snooty Ooty'—in the Blue Mountains of South India, subaltern Neville Chamberlain first thought of adding an extra coloured ball to the billiard table in 1875—thereby inventing the game of snooker (the nickname given to first-year cadets in the British Army).

Horses, of course, are basic to the British way of life. As is racing. Practically all the thoroughbreds in the world spring from stallions bred in the United Kingdom from the late eighteenth century—the time when the classic races of the English turf—the Oaks, the Derby, the Two Thousand Guineas - were established.

As with horse-racing so in the utterly modern sphere of motor-racing Britain is in the forefront. The names of great drivers, Stirling Moss, Jackie Stewart, Graham Hill, Jim Clark, testify to the supreme achievement of British motoring. In the sixties seven out of the eight World Champion drivers based on the Formula 1 Grand Prix races were British. Speed records on land (with driven wheels) and on water were made almost a permanent British possession by such men as John Cobb, Sir Henry Segrave and the Campbells, father Sir Malcolm and son Donald, whose water-speed record of 328 mph in January 1967 on Coniston Water was achieved, tragically, on his last and fatal run.

While motor racing should certainly be considered a sport open to all, it is astonishing to find that ski-racing is also a British invention, for the amount of snow that falls annually on England is barely measurable. Of course the ski-racing championship was not founded in the United Kingdom but

in Switzerland where in 1921 Sir Arnold Lunn's proposal for a British Championship to be awarded on the combined result of downhill race and style competition was adopted. It was entirely fitting that Sir Arnold Lunn should inaugurate this event in Switzerland, for his father Sir Henry created Murren as a sports centre by opening it up to touring parties organized by the Lunn travel organization. In this he was following in the footsteps of Thomas Cook, who had first made Switzerland a tourist attraction. What Cook did for this lovely land in the summer, Lunn did for it in the winter. Winter sports, like so many others, owe their origin to British drive and imagination. In this land of mountains Britons conquered peak after peak. Then they went farther afield to challenge the most daunting, until on Coronation Day 1953 it was announced that Sir John Hunt's team had conquered Everest.

Finally there is athletics. It would be absurd to claim that British athletes are in the lead. Their performance in the Olympic Games since the Second World War has not been particularly inspiring. But there is one achievement which will never be overtaken, that of Dr Roger Gilbert Bannister, CBE, in breaking the four-minute barrier by running one mile in 3 minutes 59 seconds on the Iffley Road track at Oxford on 6th May 1954.

To sum up: Britain's genius gave sport in its modern form to the world. The British are no longer champions at all of them, but the recent record, say from 1965 on, shows a commendable spread of victories which demonstrate that Britain still is a tremendous sporting nation in the world.

EPILOGUE

Britain, this speck of an island set in a big green sea, has had an influence on the world out of all proportion to her size or population. To have built and administered an institution like the British Empire from so microscopic a land base was one of the most astonishing feats in human history. Though the empire has vanished it leaves its mark still, from the cricket fields of India to the legal system of the United States. There was, it must be admitted, a period of post-imperial shock. But it is hard to believe that it affects the mainsprings of life today. The old Britain, like the old empire, was held together by a system of caste ('The rich man in his castle, The poor man at his gate'), 'The whole strength of England lies in the fact that the enormous majority of the English people are snobs,' G. B. Shaw once declared. It is very different now. Today brains count more than birth. It is the era of the meritocracy and not the aristocracy. The Civil Service is no longer the monopoly of the public schools: the last two Prime Ministers have been grammar-school boys.

It is among the young most of all that the spirit of classlessness exists. Two industries in which Britain led the world in the sixties, entertainment and fashion, were essentially classless, and essentially the product of vigorous young people, the Beatles, the Rolling Stones, the Mary Quants and the model girls like Twiggy.

Of course the knockers are still busy. It is said that we do not know how to sell ourselves. Yet people from all over the world queue up to learn the techniques of British salesmanship. Britain, for instance, has the world's largest sales training firm, the Tack Organization, which yearly trains salesmen for 7,000 firms, two-thirds of which are foreign firms. As the firm's chief Alfred Tack puts it: 'British salesmanship is the equal of any in the world. If sometimes we

are a little shy this need be no bad thing; customers respect and trust us because we undersell.'

It is said that we are decadent, insular and lacking in national will. There is dark talk of 'the British sickness'. If such an infection exists it is remarkable how many people want to share it. Britain is tremendously popular with foreign tourists. Over 8 million came to these islands in 1971. The number increases by an almost alarming percentage (about 15 per cent each year). Though lacking the natural advantage of steady summer sun, Britain now earns more from tourism than Britons spend abroad. 'To be an Englishman is to belong to the most exclusive club there is,' wrote the American poet, the late Ogden Nash. We are, none the less, happy to share our country. A growing army of foreigners, even those from supposedly richer countries (refugees from the urban horrors of New York, for instance), have decided to make Britain their permanent home because, quite simply, the British Isles is the best place for living.

The business of America is business. The business of Britain is very much living and enjoying life, the realization of a deeper and wider life outside the economic rat race. There remains a high degree of individual tolerance and political freedom. There is recognition that the country should still be a fit place to live in for those who have little money. So Britain does not have the great extremes of wealth and poverty that characterize America or, say, one of the newly developing countries like Brazil. The philosophy of the quick profit is not allowed to rampage through social amenities. London, almost alone among great cities, still preserves its outer circle of Green Belt.

Britain is a land rich in tradition, which some, mistakenly, equate with stagnation. But Britain has a habit of surprising the world. We surprised it in 1940 by refusing to accept what appeared to be inevitable defeat—this was, as America's great General George C. Marshall commented, 'the great factor in the salvage of our civilization'. We surprised the world in the sixties by becoming the cultural pace-setter for youth. All the signs are that we shall surprise it again. No

other country, except Western Germany, exports so high a proportion of its national product as does Britain. North Sea oil will work a massive improvement in our balance of payments. Undoubtedly this will be the springboard in the seventies and eighties for a period of growth and prosperity such as the country has never seen before. As always the process will be tempered by the British sense of fair play and moderation.

SOME MAJOR BRITISH INVENTIONS

DATE	INVENTION	INVENTOR	NATIONALITY	
1698	Steam Engine	Thomas Savery	Eng.	1650–1715
1712	Steam Engine (piston)	Thomas Newcomen	Eng.	1663–1729
1735	Chronometer	John Harrison	Eng.	1693–1776
1764	Spinning Jenny	James Hargreaves	Eng.	*d.* 1778
1765	Steam Engine (with condenser)	James Watt	Scot.	1736–1819
1769	Spinning Frame	Sir Richard Arkwright	Eng.	1732–1792
1779	Spinning Mule	Samuel Crompton	Eng.	1753–1827
1785	Power Loom	Edmund Cartwright	Eng.	1743–1823
1788	Steamboat	William Symington with Patrick Miller and James Taylor	Scot. Scot. Scot.	
1792	Gas Lighting	William Murdock	Scot.	1754–1839
1795	Hydraulic Press (hydraulic jack 1812)	Joseph Bramah	Eng.	1749–1814
1804	Locomotive	Richard Trevithick	Eng.	1771–1833
1813	Fire Extinguisher	George William Manby	Eng.	*b.* 1765
1815	Safety Lamp	Sir Humphry Davy	Eng.	1778–1829
1819	Rubber Waterproof	Charles Macintosh	Scot.	1766–1843
1821	Electric Motor	Michael Faraday	Eng.	1791–1867
1824	Cement	Joseph Aspdin	Eng.	1779–1855

1824	Electromagnet	William Sturgeon	Eng.	*b.* 1783
1825	Mechanical Thresher	Andrew Mable		
1826	Corn Reaper	Patrick Bell	Scot.	1799–1869
1830	Lawn Mower (rotating cutters)	Edwin Budding	Eng.	
1837	Telegraph	Sir William Cooke	Eng.	1806–1879
		Charles Wheatstone	Eng.	1802 1875
1837	Stethoscope	Dr William Stokes		1804 1878
1837	Screw Propeller	Sir Francis Pettit Smith	Eng.	1808–1874
1839	Bicycle	Kirkpatrick Macmillan	Scot.	1810 1878
1847	Rubber Tyres	Thomas Hancock	Eng.	1786–1865
1847	Chloroform (first used as an anaesthetic)	Sir James Young Simpson	Scot.	1811–1870
1847	Computer	Charles Babbage Originated modern automatic computer	Eng.	1791 1871
1851	Refrigerator	James Harrison In Australia	Scot.	
1853	First Man Carrying Glider	Sir George Cayley Near Brompton Hall, Yorkshire	Eng.	1773- 1857
1856	Steel Converter	Henry Bessemer	Eng.	1813–1898
1856	Aniline Dyes	Sir William Henry Perkin	G.B.	1838 1907
1860	Linoleum	Frederick Walton	G.B.	
1860	Filament Lamp	Sir Joseph Swan	Eng.	1828 1914
1861	Celluloid	Alexander Parkes	G.B.	1813- 1890
1862	Deck Chair	P & O		

DATE	INVENTION	INVENTOR	NATIONALITY	DATES
1865	Antisepsis	Joseph Lister		1827 1912
1866	Torpedo	Robert Whitehead	Eng.	1823 1905
1874	Bicycle (chain wheel drive and spoked wheel)	James Starley (Called father of the Cycle Industry; Uncle of John K. Starley; see below)	Eng.	1830–1881
1883	Rayon	Sir Joseph Swan Courtaulds, Coventry, 1905. Name Rayon adopted, 1924. Earliest factory Wilhelm Maybach, Munich, 1893	Eng.	1828–1914
1884	Motor Cycle	Edward Butler	Eng.	
1884	Carburettor (float feed spray)	Edward Butler	Eng.	
1884	Steam Turbine	Sir Charles Parsons	Eng.	1854–1931
1885	Safety Bicycle	John K. Starley The Rover Safety, Coventry	Eng.	
1888	Bicycle Tyre (pneumatic)	John Boyd Dunlop Patented Robert William Thompson, 1845	Scot.	1840 1921
1895	Radio Telegraphy	Lord Rutherford Over 1 km. at Cambridge, England.	Scot.	1871 1937
1901	Vacuum Cleaner (electric	Hubert Booth		
1902	Disc Brake	Dr F. W. Lanchester First used by Dunlop on aircraft, 1953	G B.	1868 1946
1904	Radio Valve	Sir (John) Ambrose Fleming	G.B.	1849 1945

1904	Silicones	Prof. F. S. Kipping	Eng.	1863–1949
1913	Stainless Steel	Harry Brearley First cast at Sheffield, 20th August	Eng.	
1914	Tank	Sir Ernest Swinton Built Leicester, tested Sept. 1915	Eng.	1868–1951
1919	Motor Scooter	Greville Bradshaw	Eng.	
1923	Self-winding Watch	John Harwood	Eng.	
1926	Television	John Logie Baird First public demonstration, 27th January, London First patent V. K. Zworykin (Russia, later U.S.), December 1923. First transmission, Francis Jenkins (U.S.), 13th June 1925	Scot.	1888 1946
1928	Rubber (latex foam)	Dunlop Rubber Co. Team led by E. A. Murphy at Fort Dunlop, Birmingham	G.B.	
1928	Penicillin	Sir Alexander Fleming First concentrated in 1940 by Howard Florey (1898 1968) and Ernst Chain (1906–)	Scot.	1881–1955
1929	Crease Resisting Fabrics	Tootal Broadhurst Lee Co. Ltd. First commercial application, 1932		
1932	Perspex	J. W. C. Crawfurd of I.C.I. Patented August. First in production U.S. 1935	Scot.	1901–

DATE	INVENTION	INVENTOR	NATIONALITY	DATES
1934	Catseye	Percy Shaw Commercially established by war-time blackout	Eng.	1890–
1935	Polyethylene	I.C.I. First made in Germany and U.S. in 1956: U.K. in 1960		
1935	Radar	Sir Robert Watson-Watt	Scot.	1892–
1936	Jet Engine	Sir Frank Whittle First working test-bed engine April 1936		1907–
1940	Cavity Magnetron	Sir John Randall		1905–
		Dr. Henry A. H. Boot Small tube produces microwave energy. Revolutionized radar, paved the way for microwave cooking		1917–
1941	Terylene	J. R. Whinfield	Eng.	1901–1966
		J. T. Dickson First available 1940; marketed U.S. as Dacron	Scot.	1917
1944	Paper Chromatography	A. J. P. Martin		1910–
		R. L. M. Synge Separates components of complex mixtures. Revolutionizes bio-chemistry		1914–

1953	Variable Wing	Sir Barnes Wallis First military application U.S. F.111 jet fighter, 1964	Eng.	1887–
1955	Hovercraft	Sir Christopher Cockerell	Eng.	1910–
1959	Mini Car	Sir Alec Issigonis	Eng.	1906–
1959	Mini Bike	Alex Moulton	Eng.	1920–
1964	Mini skirt	Mary Quant First mass-production for 'Swinging London' scene	Eng.	1934–

BRITISH NOBEL PRIZE WINNERS 1901–73

SCIENCE

1902 Sir Ronald Ross (1857 1932) Physiology and Medicine. Expert on tropical medicine, discovered malaria parasite.

1904 Lord (J W. S.) Rayleigh (1842 1919) Physics. Expert on sound vibrations. Co-discovered argon with Sir W. Ramsay.

Sir William Ramsay (1852 1916)—Chemistry After argon he discovered helium and other inert gases which he called neon, krypton and xenon.

1906 Sir J. J (Joseph John) Thomson (1856-1940)—Physics. Discovered the electron. Nobel Prize for work on conduction of electricity through gases.

1908 Lord (Ernest) Rutherford (1871 1937) Chemistry. Researches into radioactivity, but his greatest work was after the Nobel award in discovering nuclear theory of atom, and being first to split it.

1915 Sir William Henry Bragg (1862 1942)—Sir (William) Lawrence Bragg (1890 1971)—Physics The only father and son prize-winners in the same year, Lawrence at twenty-five being the youngest ever—for X-ray study on crystal structures.

1917 Charles Glover Barkla (1877 1944) Physics. For work on the scattering of X-rays by different elements, determining for instance that the number of electrons in the carbon atom is six.

1921 Frederick Soddy (1877 1956)—Chemistry. Discovered the isotope (the same element can come in different 'species' known as isotopes, which have the same chemical properties but different atomic weights, e.g. Uranium 238 and U 235).

1922 Francis William Aston (1874 1945) Chemistry. First separated isotopes artificially by inventing mass spectrograph which by magnetic deflection separates a lighter species of element from its heavier brother.

1922 Archibald Vivian Hill (1886–)—Physiology and Medicine (shared with Otto Meyerhof of Germany) for

his discovery relating to the production of heat in muscles.

1927 C. T. R. (Charles) Wilson (1869 1959)—Physics (shared with A. H. Compton of America). Invented cloud chamber, a fundamental instrument of atomic research, for close observation of atomic particles.

1928 Sir Owen Williams Richardson (1879-1959)—Physics, for researches on the emission of electricity from hot bodies.

1929 Sir Arthur Harden (1865 1940) Chemistry (shared with Hans von Euler-Chelpin of Sweden) for work on sugar fermentation and the enzyme action in the process, thus advancing knowledge of intermediary metabolism.
Sir Frederick Gowland Hopkins (1861 1947)—Physiology and Medicine (shared with C. Eijkman of Holland). Proved the existence of accessory factors in food afterwards known as vitamins. Awarded Nobel Prize for discovery of Vitamin D.

1932 Sir Charles Scott Sherrington (1857–1952) and Lord (Edgar Douglas) Adrian (1889) - Physiology and Medicine. Sherrington sometimes called father of neurophysiology, was leading authority on the physiology of the nervous system; his researches led to great advances in brain surgery. Awarded Nobel Prize with Adrian for discovery about the function of neurons, the ultimate anatomical unit of the nervous system.

1933 Paul Adrien Maurice Dirac (1902)—Physics (shared with E. Schroedinger of Austria) Mathematician and theoretical physicist, awarded Nobel Prize for pioneer work in quantum mechanics of the atom.

1935 Sir James Chadwick (1891–) - Physics. Discovered neutron, a key step towards atomic fission.

1936 Sir Henry Hallett Dale (1875 1968) -Physiology and Medicine (shared with Otto Loewi of Germany). Awarded Nobel Prize for work on chemical transmission of nerve impulses. His researches had profound effect on theory and practical progress of medicine.

1937 Sir George Paget Thomson (1892) Physics (shared with C. J. Davisson of America). Son of 'J.J.'; awarded Nobel Prize for work on the diffraction of electrons in crystals; the electron diffraction camera can be used to show arrangement of atoms in many liquids and solids, shedding useful light on stress problems in metals, etc.
Sir Walter Norman Haworth (1883-1950) -Chemistry

(shared with Paul Karrer of Switzerland and R. Kuhn of Germany). Awarded Nobel Prize for work on carbohydrates and Vitamin C. His first laboratory synthesis of a vitamin in 1934 paved the way for cheaper commercial production.

1945 Sir Alexander Fleming (1881 1955) Lord (Walter Howard) Florey (1898 1968) and (Sir) Ernst Boris Chain (1906) Physiology and Medicine Co-discoverers of penicillin.

1947 Sir Edward Victor Appleton (1892 1965)—Physics. Discovered the ionized layer in the upper atmosphere named after him, which reflects very short waves. This led to development of radar.

Sir Robert Robinson (1886)—Chemistry. Awarded Nobel Prize for research on molecular structure of a group of plant substances, the alkaloids This led to production of certain anti-malarial drugs.

1948 Lord (Patrick M. S) Blackett (1897)—Physics Awarded Nobel Prize for work on cosmic ray particles showing they have positive electrons (or positrons) as well as electrons.

1950 Cecil Frank Powell (1903-69) Physics. Developed photographic method for studying cosmic rays from high altitude balloons and discovered that the atomic particle known as the meson (which binds protons and neutrons together) was not one but two particles, the mumeson or muon and the pi-meson or pion.

1951 Sir John Douglas Cockcroft (1897 1967) and Ernest T. S. Walton (Irish, 1903)—Physics. Made world's first atom-smashing machine.

1952 Archer John Porter Martin (1910)—and Richard Laurence Millington Synge (1914) Chemistry Invented partition or paper chromatography, a widely used research tool for separating and identifying chemical elements in a complicated mixture. This is done by simple means using a strip of filter paper instead of by a series of intricate operations. The technique is also used to study structure of giant molecules.

1953 Sir Hans Adolf Krebs (1900–)—Physiology and Medicine (shared with Fritz Lipmann of America). Discovered Krebs cycle, or citric-acid cycle. This describes the process by which cells burn and obtain energy from foodstuffs.

It consists of the oxidation or 'combustion' of carbohydrates, fats and protein leading to the formation of acetic acid and the subsequent oxidation of this to carbon dioxide and water.

1954 Max Born (1882–1970)—Physics (shared with Walter Bothe of Germany) for statistical studies on wave functions. His work led to the replacement of the original quantum theory, in which electrons were regarded as particles by a more accurate and mathematical description of their observed behaviour.

1956 Sir Cyril Norman Hinshelwood (1897–1967)—Chemistry. (Shared with N Semenov of Russia). Awarded Nobel Prize for researches into mechanisms of chemical reactions.

1957 Lord (Alexander Robertus) Todd (1907)—Chemistry. Awarded Nobel Prize for work on structure of nucleic acids.

1958 Frederick Sanger (1918–)—Chemistry. Awarded Nobel Prize for work in determining the chemical structure of insulin, using Martin and Synge's paper chromatography method.

1960 Sir Peter Brian Medawar (1915)—and Sir Frank Macfarlane Burnet (Australian, 1899–)—Physiology and Medicine. Researches into immunity and the demonstration that immunological tolerance could be produced experimentally thus paving way for spectacular transplant surgery of the later sixties.

1962 Max Ferdinand Perutz (1914–) and John Cowdery Kendrew (1917)—Chemistry. Perutz determined structure of haemoglobin (component of red corpuscles) by X-ray diffraction, and Kendrew the structure of myoglobin (a globular protein like haemoglobin, but with a molecule only quarter as large).

Francis Crick (1916–), Maurice Wilkins (1916–) and James Watson (American, 1928–)—Physiology and Medicine. Unravelled the molecular structure of DNA and RNA, the molecules of heredity, which determine how genetic directions are recorded and transmitted.

1963 Sir Alan Lloyd Hodgkin (1914–), Andrew Fielding Huxley (1917–) and Sir John Carew Eccles (Australian 1903)—Physiology and Medicine. Work on nervous impulses; Hodgkin and Huxley experimented on the nerve

fibres of squids (whose nerves are × 50 human size) to establish the physical and chemical change that takes place. Nerves, like little tubes, are filled with potassium: outside in the blood is common salt containing sodium. During the passage of a nervous message (a signal, say, from burnt finger to brain) a minute quantity of sodium atoms passes into the nerve and a minute quantity of potassium goes out to produce the electricity that conducts the message to the brain. Sir John Eccles showed how the arrival of a nervous impulse in one cell activates the next in line.

1964 Dorothy Crowfoot Hodgkin (1910–),-Chemistry. Awarded Nobel Prize for X-ray analysis which elucidated structure of complex molecules, notably Vitamin B12, penicillin and sterol derivatives.

1967 Ronald George Wreyford Norrish (1897-) and George Porter (1920)—Chemistry. (Shared with Manfred Eigen of W. Germany) Research into extremely fast chemical reactions, by flash photolysis the use of a very powerful and brief pulse of light to bring about chemical changes, usually with a gas or liquid gas. The coming of lasers has made possible flashes lasting a millionth of a second and less. As a result unstable molecules with a life-span of a millionth of a second can be produced and studied, giving a new insight into the processes of chemical change.

1969 Derek Harold Richard Barton (1918)—Chemistry. (Shared with Professor Odd Hassel of Norway.) Awarded Nobel Prize for his work on conformation analysis; by studying the three-dimensional structure of molecules, rules can be set out to predict how extremely complex organic chemicals are likely to behave in chemical reactions. In short: a molecule's shape influences its properties. The technique has revolutionized understanding of how natural substances like steroids and alkaloids react. Very useful in drug research.

1970 Sir Bernard Katz (1911) Physiology and Medicine. (Shared with Ulf Van Euler of Sweden and Julius Axelrod of America) Messages are transmitted between nerve cells and muscles by chemical and not physical means; Katz isolated and analysed one of the transmitting substances, a chemical called acetyl choline which is released

in packets called quanta. When it is released a message passes along the nerve to the muscle.

1971 Dennis Gabor (1900–)—Physics. For inventing and developing the holographic method a type of lensless photography in which lasers are used to produce a three-dimensional photograph of an object. In effect, a light-wave can be frozen into a photographic plate by means of another beam, and revived by laser illumination. This could be the most important application for the laser yet, particularly for the storage in immense quantities of information in an 'optical computer' and for three-dimensional television.

1972 Rodney Robert Porter (1917–) Physiology and Medicine (shared with Gerald Edelman of U.S.). For discoveries concerning the chemical structure of antibodies.

1973 Nikolaas Tinbergen (1907) Physiology and Medicine (shared with Konrad Lorenz and Karl von Frisch, both of Austria). For studies of bird and animal behaviour, e g the stickleback's courtship and reproductive behaviour and the food begging habits of nestling seagulls.

Brian David Josephson (1940–) Physics (shared with Ivar Giaever of U.S. and Dr. Leo Esaki of Japan) Discovered the Josephson effect when two superconductors are separated by a layer of insulating material. Superconductivity of electricity occurs when five metals are cooled to within a few degrees of absolute zero. Potential important applications for computers and a wide range of new scientific instruments.

Geoffrey Wilkinson (1921)—Chemistry (shared with Ernst Otto Fischer of Germany). His research opened a way of joining metals to molecules of organic chemicals to produce new structures. Could lead to substitute for lead now used in petrol.

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